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Graham

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(54) **SYSTEM AND METHOD FOR DETERMINING A SAFE RETURN TO A VEHICLE**

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H04W 4/44	(2018.01)
H04W 4/029	(2018.01)
H04W 4/48	(2018.01)
H04M 1/72454	(2021.01)

(52) **U.S. Cl.**

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CPC H04M 1/72538; H04M 1/72569; H04M 1/72421; H04M 1/72454; H04W 4/48; H04W 4/44; H04W 4/029

See application file for complete search history.

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(57) **ABSTRACT**

A system and method for determining a safe return to a vehicle that include determining at least one safety feature setting associated with at least one vehicle based safety response that is related to a travel plan. The system and method also include determining if the user departs from the designated location to return to the vehicle and determining if there is a deviation from the travel plan that pertains to the user safely returning to the vehicle from the designated location. The system and method further include controlling at least one component of the vehicle to operate based on the at least one safety feature setting to execute the at least one vehicle based safety response when it is determined that there is deviation from the travel plan.

20 Claims, 8 Drawing Sheets

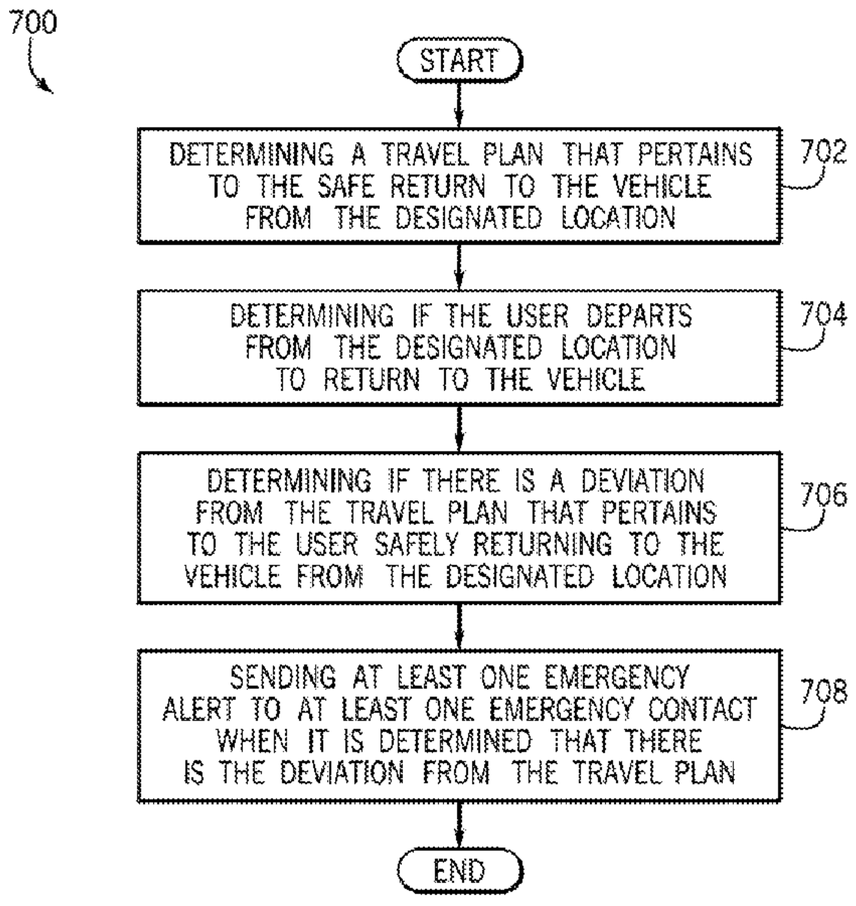

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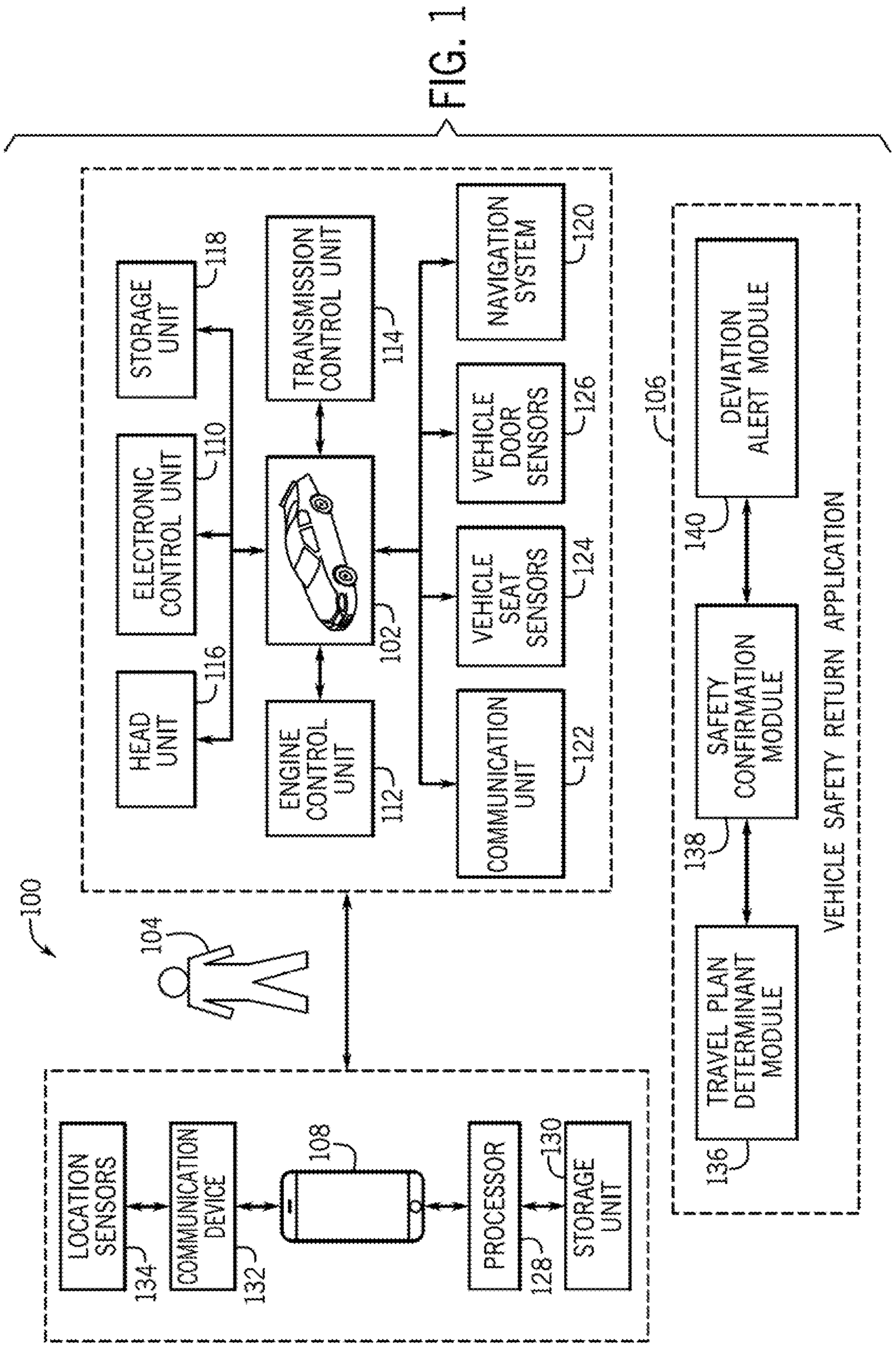
FIG. 1


100
104
102
106
108
110
112
114
116
118
120
122
124
126
128
130
132
134
136
138
140
HEAD UNIT
ELECTRONIC CONTROL UNIT
STORAGE UNIT
ENGINE CONTROL UNIT
TRANSMISSION CONTROL UNIT
NAVIGATION SYSTEM
COMMUNICATION UNIT
VEHICLE SEAT SENSORS
VEHICLE DOOR SENSORS
DEVIATION ALERT MODULE
SAFETY CONFIRMATION MODULE
TRAVEL PLAN DETERMINANT MODULE
LOCATION SENSORS
COMMUNICATION DEVICE
PROCESSOR
STORAGE UNIT
VEHICLE SAFETY RETURN APPLICATION

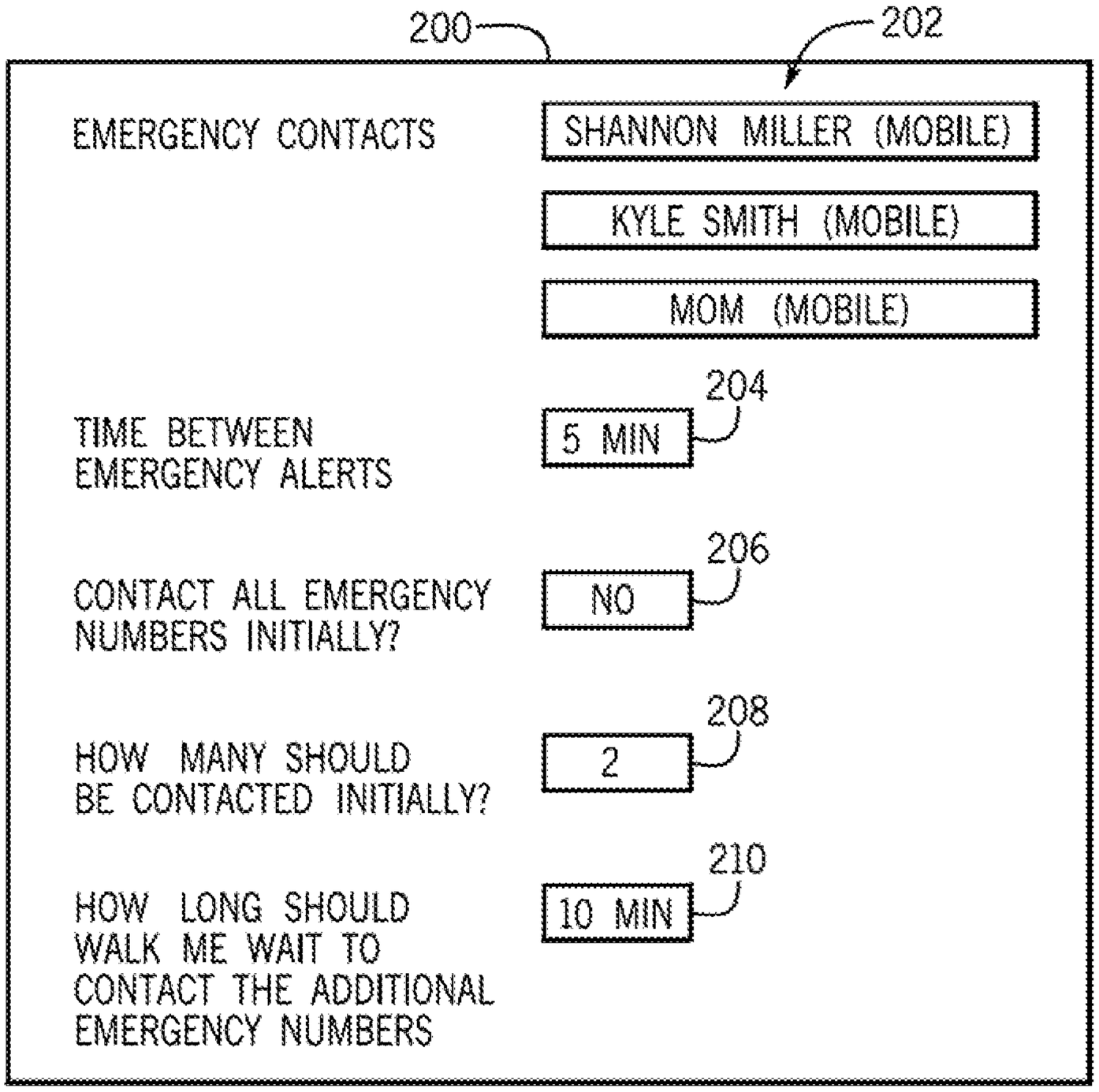

200
202
EMERGENCY CONTACTS
SHANNON MILLER (MOBILE)
KYLE SMITH (MOBILE)
MOM (MOBILE)
204
TIME BETWEEN EMERGENCY ALERTS
5 MIN
206
CONTACT ALL EMERGENCY NUMBERS INITIALLY?
NO
208
HOW MANY SHOULD BE CONTACTED INITIALLY?
2
210
HOW LONG SHOULD WALK ME WAIT TO CONTACT THE ADDITIONAL EMERGENCY NUMBERS
10 MIN

FIG. 2

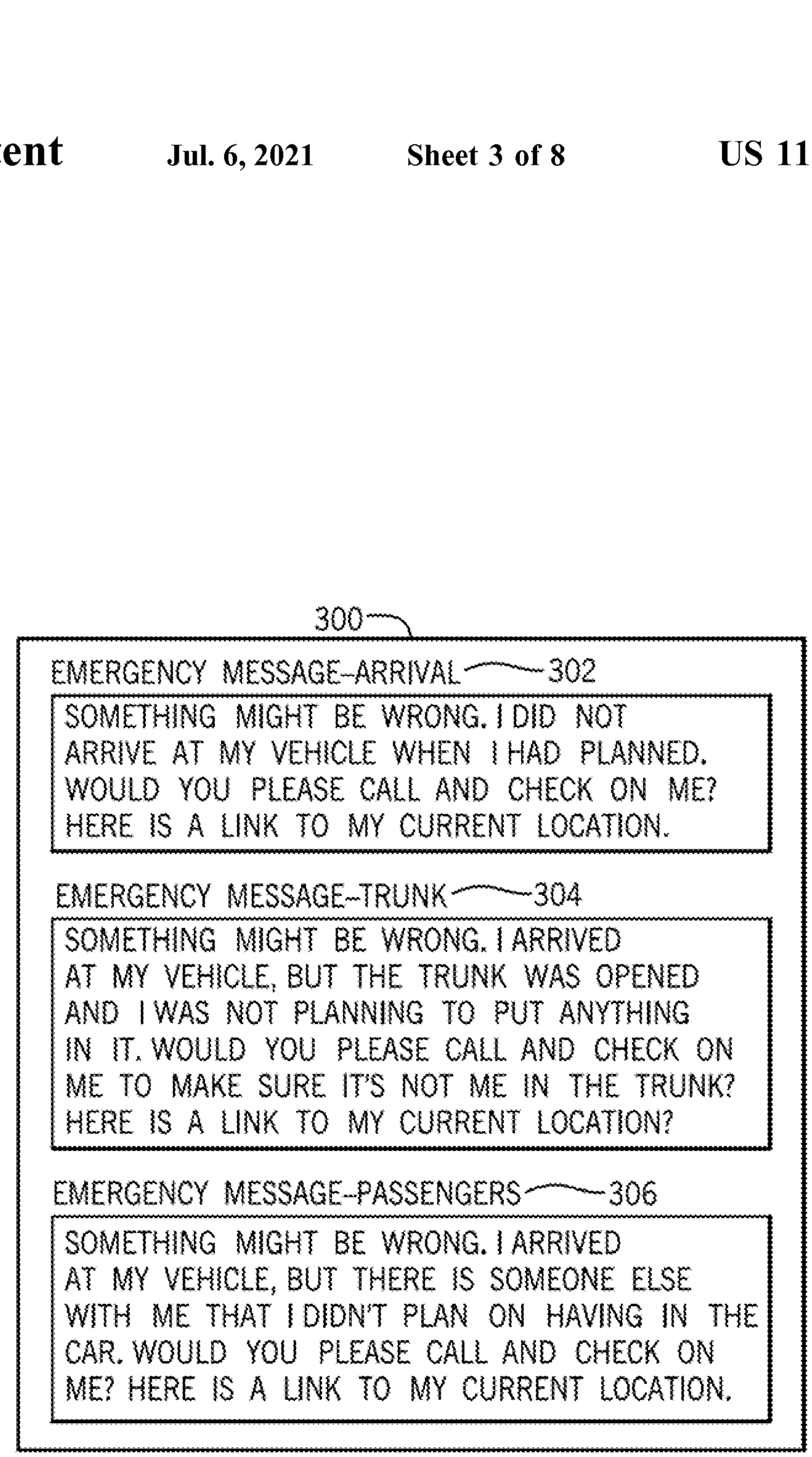

300
EMERGENCY MESSAGE-ARRIVAL
302
SOMETHING MIGHT BE WRONG. I DID NOT ARRIVE AT MY VEHICLE WHEN I HAD PLANNED. WOULD YOU PLEASE CALL AND CHECK ON ME? HERE IS A LINK TO MY CURRENT LOCATION.
EMERGENCY MESSAGE-TRUNK
304
SOMETHING MIGHT BE WRONG. I ARRIVED AT MY VEHICLE, BUT THE TRUNK WAS OPENED AND I WAS NOT PLANNING TO PUT ANYTHING IN IT. WOULD YOU PLEASE CALL AND CHECK ON ME TO MAKE SURE IT'S NOT ME IN THE TRUNK? HERE IS A LINK TO MY CURRENT LOCATION?
EMERGENCY MESSAGE-PASSENGERS
306
SOMETHING MIGHT BE WRONG. I ARRIVED AT MY VEHICLE, BUT THERE IS SOMEONE ELSE WITH ME THAT I DIDN'T PLAN ON HAVING IN THE CAR. WOULD YOU PLEASE CALL AND CHECK ON ME? HERE IS A LINK TO MY CURRENT LOCATION.

FIG. 3

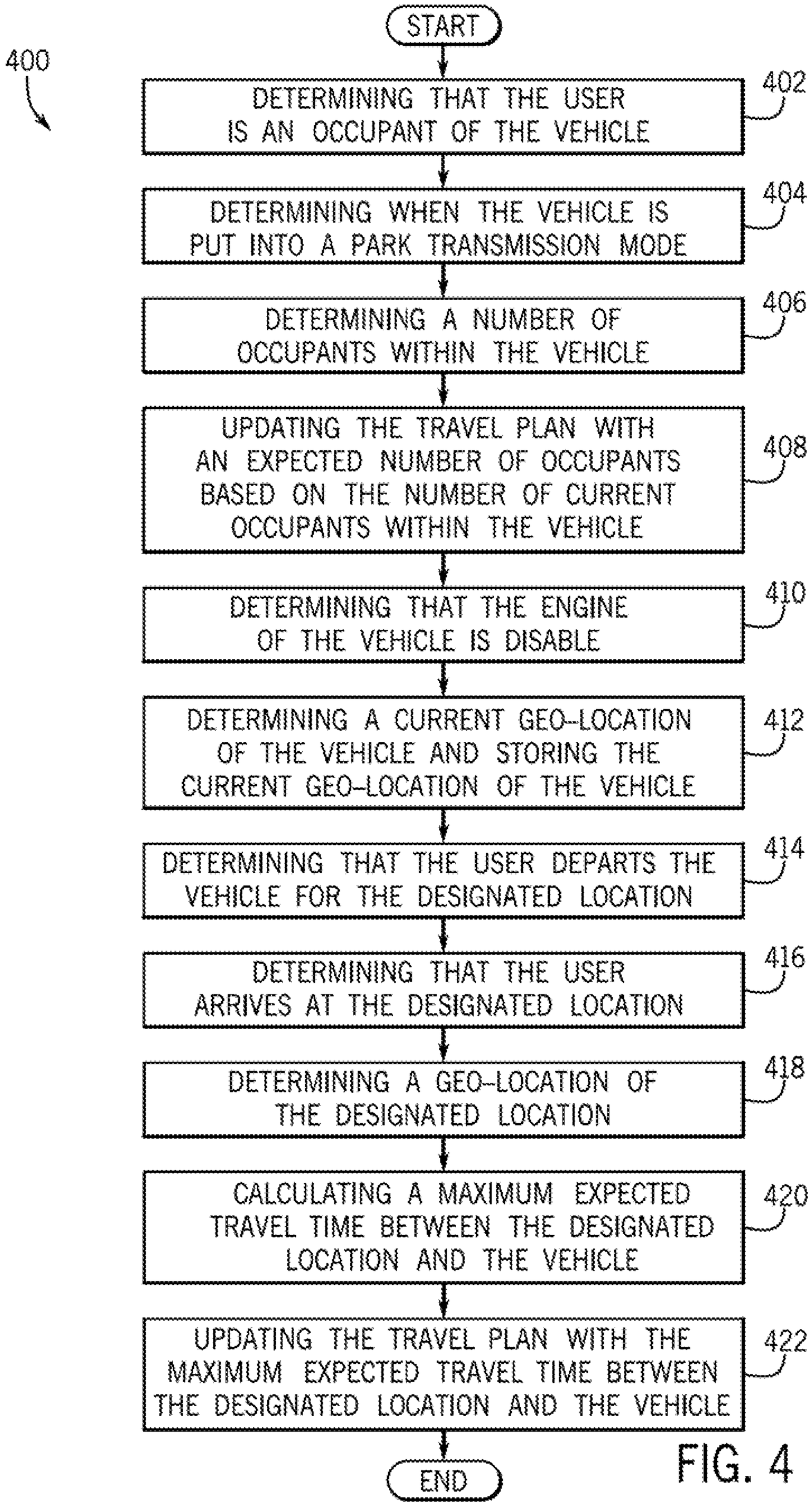

400
START
DETERMINING THAT THE USER IS AN OCCUPANT OF THE VEHICLE
402
DETERMINING WHEN THE VEHICLE IS PUT INTO A PARK TRANSMISSION MODE
404
DETERMINING A NUMBER OF OCCUPANTS WITHIN THE VEHICLE
406
UPDATING THE TRAVEL PLAN WITH AN EXPECTED NUMBER OF OCCUPANTS BASED ON THE NUMBER OF CURRENT OCCUPANTS WITHIN THE VEHICLE
408
DETERMINING THAT THE ENGINE OF THE VEHICLE IS DISABLE
410
DETERMINING A CURRENT GEO-LOCATION OF THE VEHICLE AND STORING THE CURRENT GEO-LOCATION OF THE VEHICLE
412
DETERMINING THAT THE USER DEPARTS THE VEHICLE FOR THE DESIGNATED LOCATION
414
DETERMINING THAT THE USER ARRIVES AT THE DESIGNATED LOCATION
416
DETERMINING A GEO-LOCATION OF THE DESIGNATED LOCATION
418
CALCULATING A MAXIMUM EXPECTED TRAVEL TIME BETWEEN THE DESIGNATED LOCATION AND THE VEHICLE
420
UPDATING THE TRAVEL PLAN WITH THE MAXIMUM EXPECTED TRAVEL TIME BETWEEN THE DESIGNATED LOCATION AND THE VEHICLE
422
END

FIG. 4

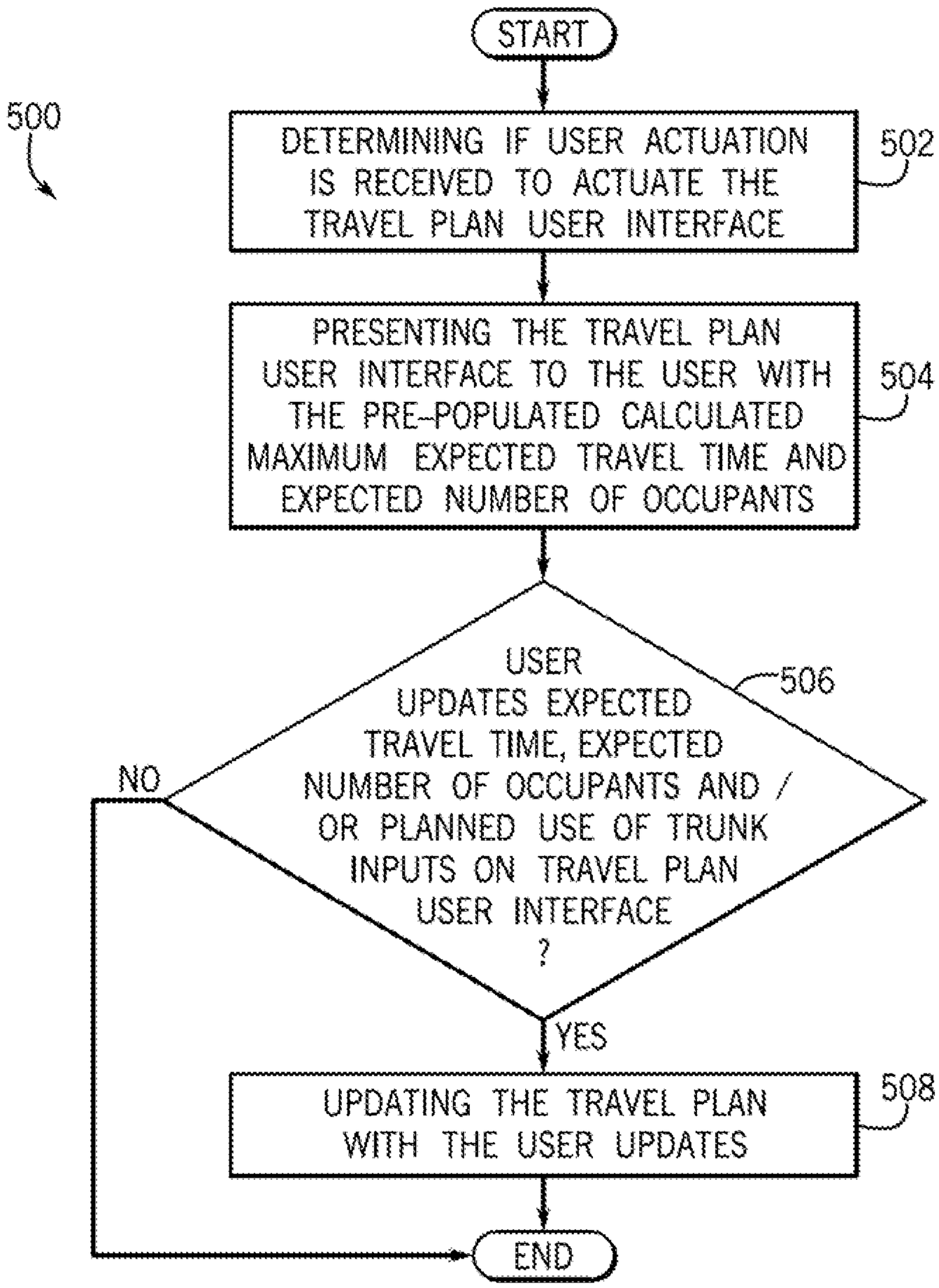

500
START
DETERMINING IF USER ACTUATION IS RECEIVED TO ACTUATE THE TRAVEL PLAN USER INTERFACE
502
PRESENTING THE TRAVEL PLAN USER INTERFACE TO THE USER WITH THE PRE-POPULATED CALCULATED MAXIMUM EXPECTED TRAVEL TIME AND EXPECTED NUMBER OF OCCUPANTS
504
USER UPDATES EXPECTED TRAVEL TIME, EXPECTED NUMBER OF OCCUPANTS AND / OR PLANNED USE OF TRUNK INPUTS ON TRAVEL PLAN USER INTERFACE ?
506
NO
YES
UPDATING THE TRAVEL PLAN WITH THE USER UPDATES
508
END

FIG. 5A

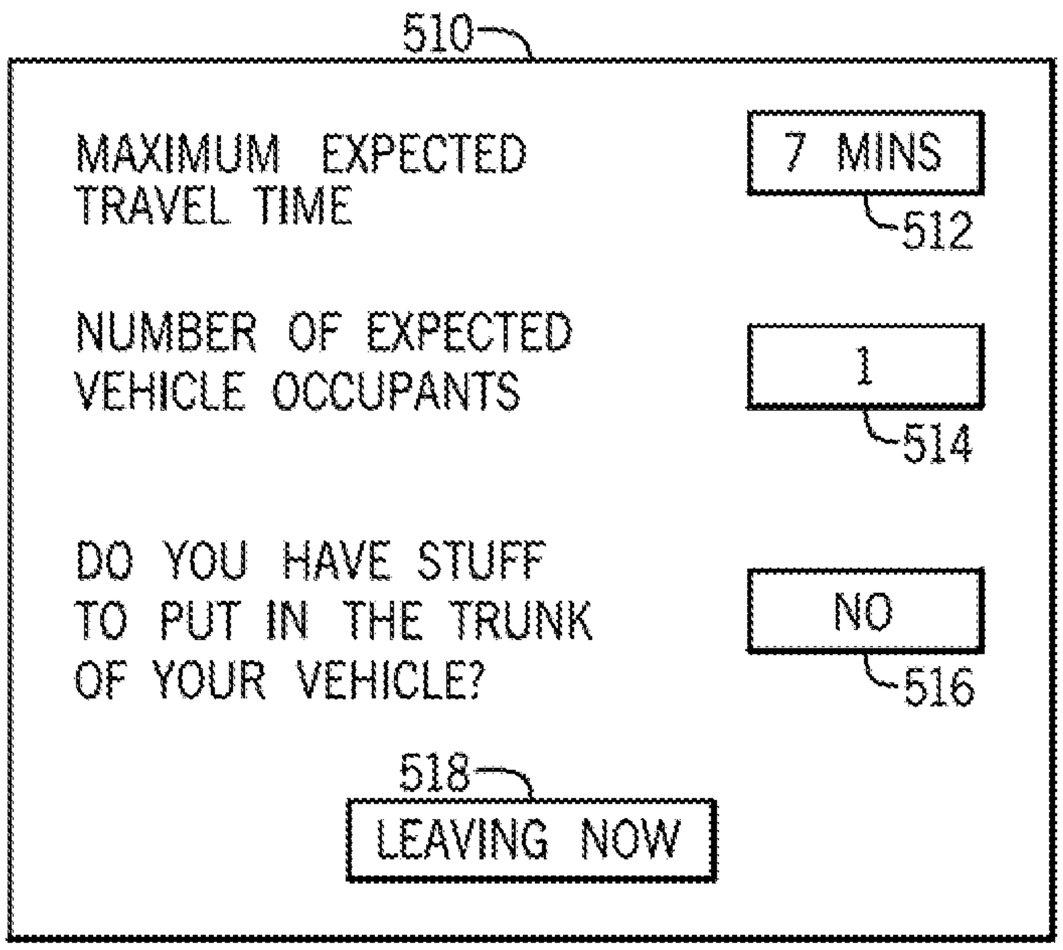

510
MAXIMUM EXPECTED TRAVEL TIME
7 MINS
512
NUMBER OF EXPECTED VEHICLE OCCUPANTS
1
514
DO YOU HAVE STUFF TO PUT IN THE TRUNK OF YOUR VEHICLE?
NO
516
518
LEAVING NOW

FIG. 5B

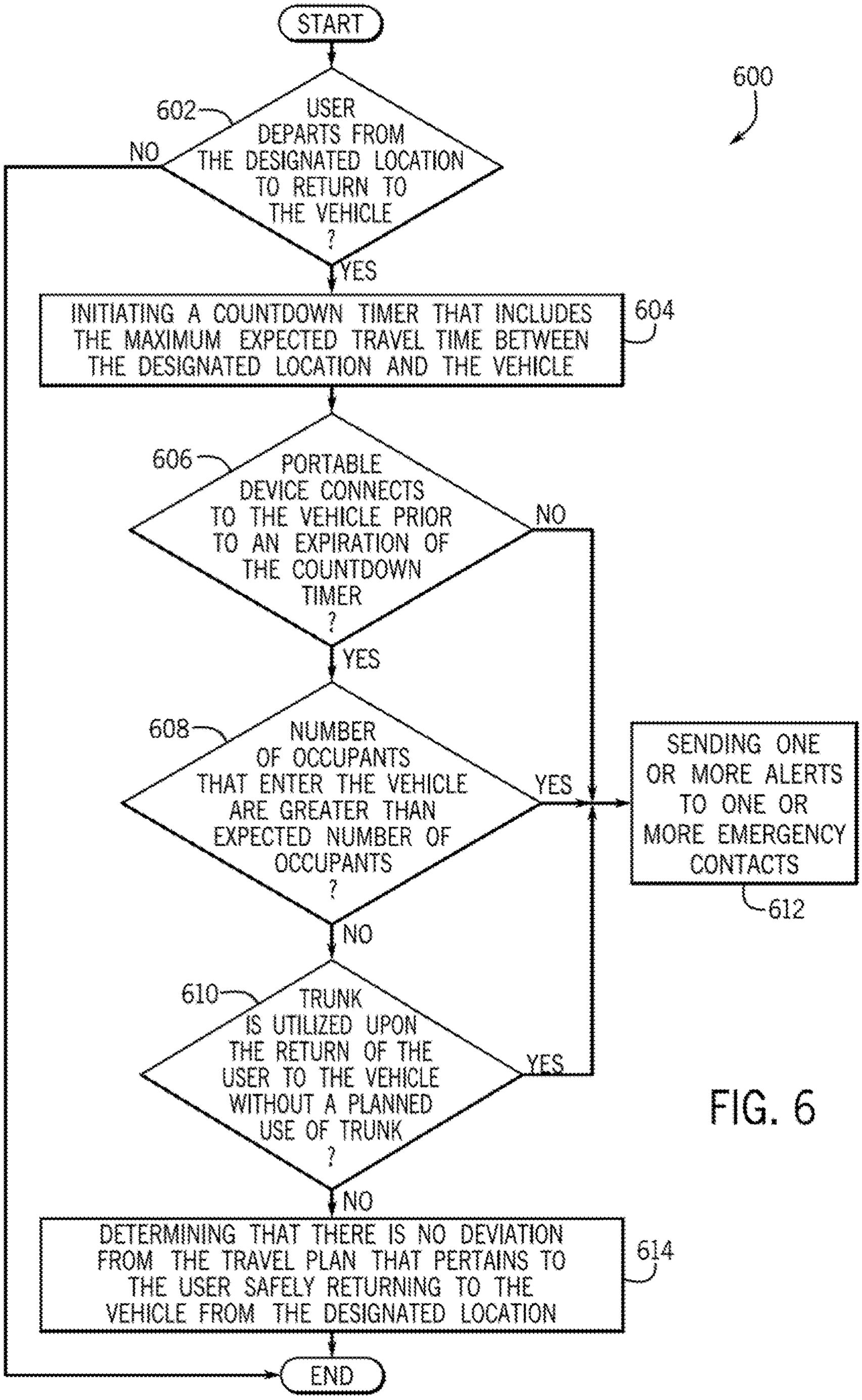

600
START
602
USER DEPARTS FROM THE DESIGNATED LOCATION TO RETURN TO THE VEHICLE ?
NO
YES
INITIATING A COUNTDOWN TIMER THAT INCLUDES THE MAXIMUM EXPECTED TRAVEL TIME BETWEEN THE DESIGNATED LOCATION AND THE VEHICLE
604
606
PORTABLE DEVICE CONNECTS TO THE VEHICLE PRIOR TO AN EXPIRATION OF THE COUNTDOWN TIMER ?
NO
YES
608
NUMBER OF OCCUPANTS THAT ENTER THE VEHICLE ARE GREATER THAN EXPECTED NUMBER OF OCCUPANTS ?
YES
NO
SENDING ONE OR MORE ALERTS TO ONE OR MORE EMERGENCY CONTACTS
612
610
TRUNK IS UTILIZED UPON THE RETURN OF THE USER TO THE VEHICLE WITHOUT A PLANNED USE OF TRUNK ?
YES
NO
DETERMINING THAT THERE IS NO DEVIATION FROM THE TRAVEL PLAN THAT PERTAINS TO THE USER SAFELY RETURNING TO THE VEHICLE FROM THE DESIGNATED LOCATION
614
END

FIG. 6

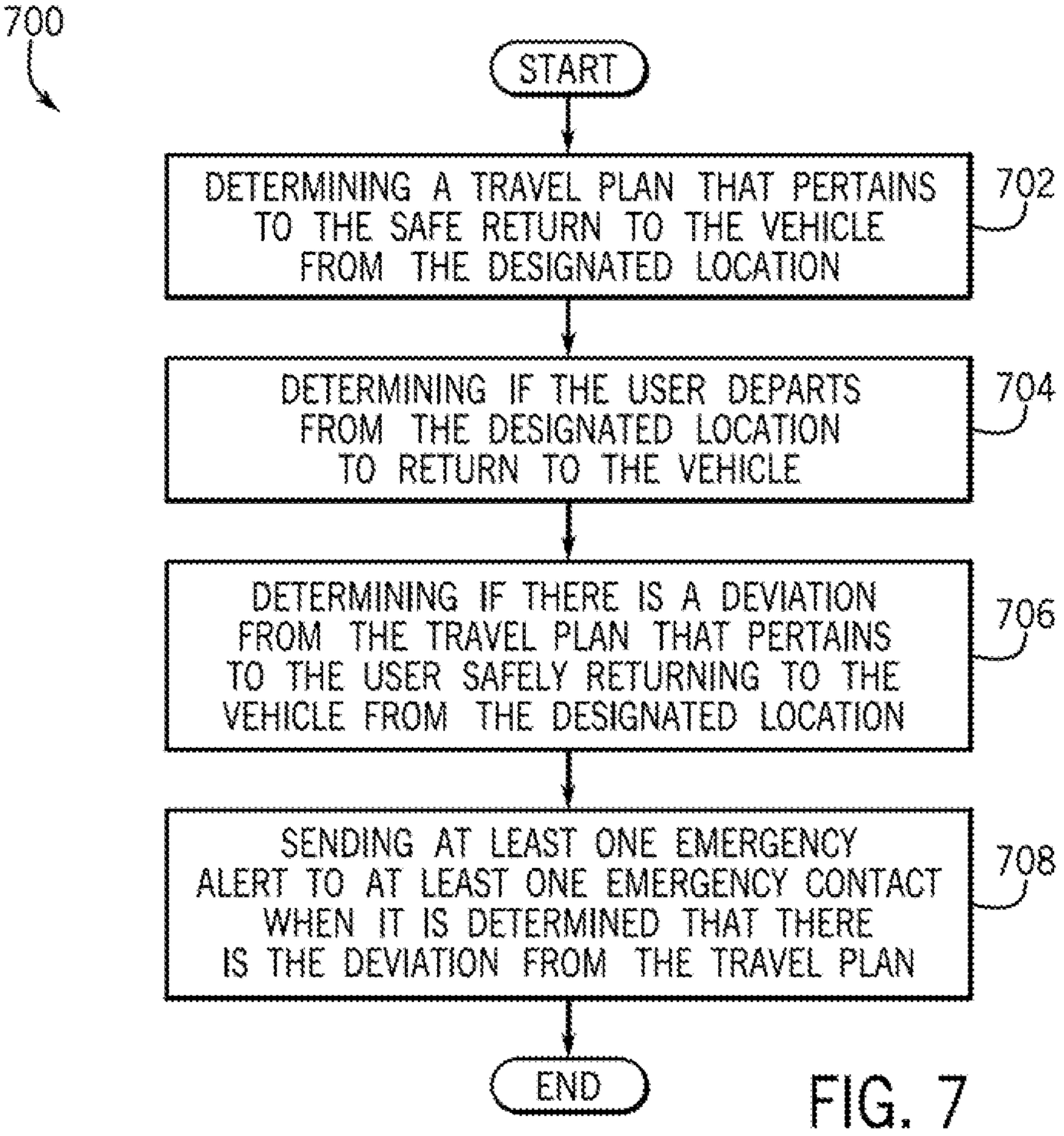

700
START
DETERMINING A TRAVEL PLAN THAT PERTAINS TO THE SAFE RETURN TO THE VEHICLE FROM THE DESIGNATED LOCATION
702
DETERMINING IF THE USER DEPARTS FROM THE DESIGNATED LOCATION TO RETURN TO THE VEHICLE
704
DETERMINING IF THERE IS A DEVIATION FROM THE TRAVEL PLAN THAT PERTAINS TO THE USER SAFELY RETURNING TO THE VEHICLE FROM THE DESIGNATED LOCATION
706
SENDING AT LEAST ONE EMERGENCY ALERT TO AT LEAST ONE EMERGENCY CONTACT WHEN IT IS DETERMINED THAT THERE IS THE DEVIATION FROM THE TRAVEL PLAN
708
END

FIG. 7

SYSTEM AND METHOD FOR DETERMINING A SAFE RETURN TO A VEHICLE

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation of, and claims priority to, U.S. application Ser. No. 15/898,772, filed on Feb. 19, 2018, the entire application of which is incorporated herein by reference.

BACKGROUND

In many instances, individuals may find themselves in circumstances where they are required to return from a location (e.g., workplace, shopping center) to their vehicle in unsafe conditions. For example, a driver may be required to walk back to their vehicle after completing a late night shift at a workplace. In such cases, drivers have been susceptible to risk of crime such as kidnapping or carjacking that may occur during their return to their vehicle. In many of these cases, based on the circumstances of conditions, no one is made aware of the possible occurrence of the crime until a large duration of time after such an incident has taken place. Therefore, the driver may not be able to be located and/or assisted within an urgent manner.

BRIEF DESCRIPTION

According to one aspect, a computer-implemented method for determining a safe return to a vehicle that includes determining at least one safety feature setting associated with at least one vehicle based safety response that is related to a travel plan. The travel plan pertains to the safe return of a user to the vehicle from a designated location. The computer-implemented method also includes determining if the user departs from the designated location to return to the vehicle and determining if there is a deviation from the travel plan that pertains to the user safely returning to the vehicle from the designated location. The computer-implemented method further includes controlling at least one component of the vehicle to operate based on the at least one safety feature setting to execute the at least one vehicle based safety response when it is determined that there is deviation from the travel plan.

According to another aspect, a computer-implemented method for determining a safe return to a vehicle that includes creating a travel plan that pertains to the safe return of a user to the vehicle from a designated location. The travel plan includes details associated with a utilization of the vehicle and a travel time associated with travel between the vehicle and the designated location. The computer-implemented method also includes determining if the user departs from the designated location to return to the vehicle and determining if there is a deviation from the travel plan that pertains to the user safely returning to the vehicle from the designated location. The computer-implemented method further includes sending at least one emergency alert to at least one emergency contact upon determining the deviation from the travel plan.

According to still another aspect, a system for determining a safe return to a vehicle that includes a memory storing instructions when executed by a processor cause the processor to create a travel plan that pertains to the safe return of a user to the vehicle from a designated location. The travel plan includes details associated with a utilization of the vehicle and a travel time associated with travel between the vehicle and the designated location. The instructions also cause the processor to determine if the user departs from the designated location to return to the vehicle and determine if there is a deviation from the travel plan that pertains to the user safely returning to the vehicle from the designated location. The instructions further cause the processor to send at least one emergency alert to at least one emergency contact upon determining the deviation from the travel plan.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed to be characteristic of the disclosure are set forth in the appended claims. In the descriptions that follow, like parts are marked throughout the specification and drawings with the same numerals, respectively. The drawing figures are not necessarily drawn to scale and certain figures can be shown in exaggerated or generalized form in the interest of clarity and conciseness. The disclosure itself, however, as well as a preferred mode of use, further objects and advances thereof, will be best understood by reference to the following detailed description of illustrative embodiments when read in conjunction with the accompanying drawings, wherein:

FIG. **1** is a schematic view of an exemplary operating environment of a vehicle safety return alert system according to an exemplary embodiment;

FIG. **2** is an illustrated example of an emergency contact settings interface according to an exemplary embodiment;

FIG. **3** is an illustrated example of an emergency alert setup interface according to an exemplary embodiment;

FIG. **4** is a process flow diagram of a method for determining a travel plan that pertains to the return of a user from the designated location during travel of a vehicle according to an exemplary embodiment;

FIG. **5**A is a process flow diagram of a method for presenting a travel plan user interface to the user according to an exemplary embodiment.

FIG. **5**B is an illustrated example of the travel plan user interface according to an exemplary embodiment;

FIG. **6** is a process flow diagram of a method for determining if there is a deviation from the travel plan that pertains to the user safely returning to the vehicle according to an exemplary embodiment; and

FIG. **7** is a process flow diagram of a method for determining a deviation with respect to a safe return to the vehicle according to an exemplary embodiment.

DETAILED DESCRIPTION

The following includes definitions of selected terms employed herein. The definitions include various examples and/or forms of components that fall within the scope of a term and that can be used for implementation. The examples are not intended to be limiting.

A "processor," as used herein, processes signals and performs general computing and arithmetic functions. Signals processed by the processor can include digital signals, data signals, computer instructions, processor instructions, messages, a bit, a bit stream, or other computing that can be received, transmitted and/or detected.

A "bus", as used herein, refers to an interconnected architecture that is operably connected to other computer components inside a computer or between computers. The bus can transfer data between the computer components. The bus can be a memory bus, a memory controller, a peripheral bus, an external bus, a crossbar switch, and/or a

local bus, among others. The bus can also be a vehicle bus that interconnects components inside a vehicle using protocols such as Media Oriented Systems Transport (MOST), Controller Area network (CAN), Local Interconnect Network (LIN), among others.

"Computer communication", as used herein, refers to a communication between two or more computing devices (e.g., computer, personal digital assistant, cellular telephone, network device) and can be, for example, a network transfer, a file transfer, an applet transfer, an email, a hypertext transfer protocol (HTTP) transfer, and so on. A computer communication can occur across, for example, a wireless system (e.g., IEEE 802.11), an Ethernet system (e.g., IEEE 802.3), a token ring system (e.g., IEEE 802.5), a local area network (LAN), a wide area network (WAN), a point-to-point system, a circuit switching system, a packet switching system, among others.

A "disk", as used herein can be, for example, a magnetic disk drive, a solid state disk drive, a floppy disk drive, a tape drive, a Zip drive, a flash memory card, and/or a memory stick. Furthermore, the disk can be a CD-ROM (compact disk ROM), a CD recordable drive (CD-R drive), a CD rewritable drive (CD-RW drive), and/or a digital video ROM drive (DVD ROM). The disk can store an operating system that controls or allocates resources of a computing device.

A "database", as used herein can refer to table, a set of tables, a set of data stores and/or methods for accessing and/or manipulating those data stores. Some databases can be incorporated with a disk as defined above.

A "memory", as used herein can include volatile memory and/or non-volatile memory. Non-volatile memory can include, for example, ROM (read only memory), PROM (programmable read only memory), EPROM (erasable PROM), and EEPROM (electrically erasable PROM). Volatile memory can include, for example, RAM (random access memory), synchronous RAM (SRAM), dynamic RAM (DRAM), synchronous DRAM (SDRAM), double data rate SDRAM (DDR SDRAM), and direct RAM bus RAM (DRRAM). The memory can store an operating system that controls or allocates resources of a computing device.

A "module", as used herein, includes, but is not limited to, non-transitory computer readable medium that stores instructions, instructions in execution on a machine, hardware, firmware, software in execution on a machine, and/or combinations of each to perform a function(s) or an action(s), and/or to cause a function or action from another module, method, and/or system. A module may also include logic, a software controlled microprocessor, a discrete logic circuit, an analog circuit, a digital circuit, a programmed logic device, a memory device containing executing instructions, logic gates, a combination of gates, and/or other circuit components. Multiple modules may be combined into one module and single modules may be distributed among multiple modules.

An "operable connection", or a connection by which entities are "operably connected", is one in which signals, physical communications, and/or logical communications can be sent and/or received. An operable connection can include a wireless interface, a physical interface, a data interface and/or an electrical interface.

A "processor", as used herein, processes signals and performs general computing and arithmetic functions. Signals processed by the processor can include digital signals, data signals, computer instructions, processor instructions, messages, a bit, a bit stream, or other means that can be received, transmitted and/or detected. Generally, the processor can be a variety of various processors including multiple single and multicore processors and co-processors and other multiple single and multicore processor and co-processor architectures. The processor can include various modules to execute various functions.

A "vehicle", as used herein, refers to any moving vehicle that is capable of carrying one or more human occupants and is powered by any form of energy. The term "vehicle" includes, but is not limited to: cars, trucks, vans, minivans, SUVs, motorcycles, scooters, boats, go-karts, amusement ride cars, rail transport, personal watercraft, and aircraft. In some cases, a motor vehicle includes one or more engines. Further, the term "vehicle" can refer to an electric vehicle (EV) that is capable of carrying one or more human occupants and is powered entirely or partially by one or more electric motors powered by an electric battery. The EV can include battery electric vehicles (EV) and plug-in hybrid electric vehicles (PHEV). The term "vehicle" can also refer to an autonomous vehicle and/or self-driving vehicle powered by any form of energy. The autonomous vehicle may or may not carry one or more human occupants. Further, the term "vehicle" can include vehicles that are automated or non-automated with pre-determined paths or free-moving vehicles.

A "value" and "level", as used herein can include, but is not limited to, a numerical or other kind of value or level such as a percentage, a non-numerical value, a discrete state, a discrete value, a continuous value, among others. The term "value of X" or "level of X" as used throughout this detailed description and in the claims refers to any numerical or other kind of value for distinguishing between two or more states of X. For example, in some cases, the value or level of X may be given as a percentage between 0% and 100%. In other cases, the value or level of X could be a value in the range between 1 and 10. In still other cases, the value or level of X may not be a numerical value, but could be associated with a given discrete state, such as "not X", "slightly x", "x", "very x" and "extremely x".

I. System Overview

Referring now to the drawings, wherein the showings are for purposes of illustrating one or more exemplary embodiments and not for purposes of limiting the same, FIG. **1** is a schematic view of an exemplary operating environment of a vehicle safety return alert system **100** according to an exemplary embodiment. The components of the vehicle safety return alert system **100**, as well as the components of other systems, hardware architectures and software architectures discussed herein, may be combined, omitted or organized into different architecture for various embodiments. However, the exemplary embodiments discussed herein focus on the system **100** as illustrated in FIG. **1**, with corresponding system components, and related methods.

As shown in the illustrated embodiment of FIG. **1**, the system **100** may include a vehicle **102** which contains one or more occupants (not shown) including a user **104** (e.g., driver, occupant) of the vehicle **102**. The system **100** may additionally include a vehicle safety return alert application **106** (safety alert application). As discussed in more detail below, the safety alert application **106** may be executed by the vehicle **102** and/or a portable device **108** used by the user **104** determine and populate a travel plan that is associated with a travel of the user between a designated location (e.g., workplace, store, restaurant, etc.) predetermined by the user **104** or determined by the application **106** and the (parked) vehicle **102**. In particular, the travel plan may be automatically updated by the application **106** and/or manually updated by the user **104**.

As discussed in more detail below, upon user actuation and determining that the user **104** is leaving the designated location to return to the vehicle **102**, the application **106** may be configured to determine if there is a deviation from the travel plan with respect to the user **104** safely returning to the vehicle **102** from the designated location. In particular, the deviation may be determined based on the user **104** not arriving to the vehicle **102** within a maximum expected travel time between the designated location and the vehicle **102**. Additionally, the deviation may be determined based on a determination a number of occupants that enter the user's return to the vehicle **102** are above an expected number of occupants and/or an unexpected opening of a trunk door (not shown) of the vehicle **102** occurs upon the user's return to the vehicle **102**.

The safety alert application **106** allows the user **104** to designate one or more emergency contacts that may be utilized by the application **106** upon determining the deviation from the travel plan with respect to the user **104** safely returning to the vehicle **102**. In particular, upon such a determination, the application **106** may send one or more silent alerts to the one or more user designated emergency contacts that may include an alert message that may pertain to the determined deviation of the travel plan with respect to the user **104** safely returning to the vehicle **102**.

With continued reference to FIG. **1**, the vehicle **102** may generally include an electronic control unit (ECU) **110** that operably controls a plurality of components of the vehicle **102**. In an exemplary embodiment, the ECU **110** of the vehicle **102** may include a processor (not shown), a memory (not shown), a disk (not shown), and an input/output (I/O) interface (not shown), which are each operably connected for computer communication via a bus (not shown). The I/O interface provides software and hardware to facilitate data input and output between the components of the ECU **110** and other components, networks, and data sources, of the system **100**. In one embodiment, the ECU **110** may execute one or more operating systems, applications, and/or interfaces that are associated with the vehicle **102**.

In one or more configurations, the ECU **110** may be in communication with an engine control unit **112** and a transmission control unit **114** of the vehicle **102**. The ECU **110** may communicate with the engine control unit **112** to determine enablement (e.g., turning ON) and disablement (e.g., turning OFF) of an engine of the vehicle **102**. The ECU **110** may additionally communicate with the transmission control unit **114** to determine a current transmission mode of the vehicle **102** (e.g., drive, reverse, park). As discussed below, the ECU **110** may communicate with the engine control unit **112** and the transmission control unit **114** to determine when the engine of the vehicle **102** is disabled and when the vehicle **102** is put into the park transmission mode (e.g., and parked) and may communicate respective data to the application **106**.

In one embodiment, the ECU **110** is additionally operably connected for computer communication with a head unit **116**. The head unit **116** may include internal processing memory, an interface circuit, and bus lines (components of the head unit not shown) for transferring data, sending commands, and communicating with the components of the vehicle **102**. In one or more embodiments, the ECU **110** and/or the head unit **116** may execute one or more operating systems, applications, and/or interfaces that are associated to the vehicle **102** through a display unit (not shown) of the head unit **116**. In particular, the display unit may be disposed within a center stack area of the vehicle **102** and may be utilized to display one or more application human machine interfaces (application HMI) to provide the user **104** with various types of information and/or to receive one or more inputs from the user **104**. The display unit may be capable of receiving inputs from the user **104** directly or through an associated keyboard/touchpad (not shown) In one embodiment, the application HMIs may pertain to one or more application interfaces, including one or more user interfaces associated with the safety alert application **106**. As discussed below, the one or more user interfaces associated with the application **106** may be presented through the display unit and/or the portable device **108** used by the user **104**.

In an exemplary embodiment, the vehicle **102** may additionally include a storage unit **118**. The storage unit **118** may store one or more operating systems, applications, associated operating system data, application data, vehicle system and subsystem user interface data, and the like that are executed by the ECU **110**, the head unit **116**, and one or more applications executed by the ECU **110** and/or the head unit **116** including the safety alert application **106**. In one embodiment, the storage unit **118** may additionally store map data that may be accessed by a navigation system **120** of the vehicle **102** to determine directional data, distance data, environmental data, and point of interest data pertaining to one or more locations at which the vehicle **102** is located. The map data may include data that pertains to geographical maps and satellite/aerial imagery of one or more locations at which the vehicle **102** is located. The map data may additionally be accessed by one or more applications executed by the ECU **110** and/or the head unit **116**. As discussed below, the safety alert application **106** may access the map data to calculate the maximum expected travel time between the designated location and the location of the vehicle **102** upon the user's utilization of the application **106**.

The storage unit **118** may additionally be configured to store the travel plan that is associated with the user **104** and the designated location. The travel plan may be stored as a data file that may be created and updated each time the application **106** determines that the vehicle **102** is put into the park transmission mode or that the user **104** actuates the application **106** to create the travel plan. As discussed below, the travel plan may be automatically updated by the application **106** and/or manually updated by the user **104** through a travel plan user interface (shown as an illustrative example in FIG. **5**B) that is presented to the user **104**. It is to be appreciated that the storage unit **118** may include additional travels plans associated with additional users (not shown) and/or additional designated locations which the user **104** may visit.

In one embodiment, the navigation system **120** of the vehicle **102** may include a global positioning sensor (not shown) that is configured to determine a current geo-location (e.g., GPS, DGPS coordinates) of the vehicle **102**. The current geo-location of the vehicle **102** may be utilized along with map data from the storage unit **118** to provide turn-by-turn directions within the vehicle **102**. Additionally, one or more applications may communicate with the navigation system **120** to determine data associated with the current geo-location of the vehicle **102**. For instance, the safety alert application **106** may communicate with the navigation system **120** to determine the current geo-location of the vehicle **102** upon determining that the vehicle **102** has been disabled and/or upon determining the user's return to the vehicle **102** from the designated location.

In addition to the navigation system **120**, the vehicle **102** may include one or more additional vehicle systems (not shown) that may include, but may not be limited to, a vehicle

lighting system, a vehicle audio system, a vehicle door lock system, a vehicle infotainment system, a vehicle telephone system, and the like. As discussed below, the safety alert application **106** may communicate with the ECU **110** to utilize and/or operably control the one or more of additional vehicle systems upon the determination of the deviation from the travel plan with respect to the user **104** safely returning to the vehicle **102**.

In an exemplary embodiment, the ECU **110** may additionally operably control a communication unit **122** of the vehicle **102**. The communication unit **122** may be capable of providing wired or wireless computer communications utilizing various protocols to send/receive non-transitory signals internally to the plurality of components of the vehicle **102** and/or externally to external devices such as the portable device **108** used by the user **104**. Generally, these protocols include a wireless system (e.g., IEEE 802.11 (Wi-Fi), IEEE 802.15.1 (Bluetooth®)), a near field communication system (NFC) (e.g., ISO 13157), a local area network (LAN), and/or a point-to-point system. More particularly, the communication unit **122** may allow connection of the portable device **108** to the vehicle **102** to allow computer communication between components of the portable device **108** and the components of the vehicle **102**. As discussed in detail below, the application **106** may utilize data provided by the communication unit **122** with respect to the connection of the portable device **108** to the vehicle **102** to determine the departure of the user **104** from the vehicle **102** and/or the return of the user **104** to the vehicle **102**.

In one or more embodiments, the vehicle **102** may additionally include vehicle seat sensors **124** that may disposed within seats (not shown) of the vehicle **102**. The vehicle seat sensors **124** may include electric current/potential (e.g., proximity sensors, inductive, capacitive), ultrasonic (e.g., piezoelectric, electrostatic), vibration, optical, vision, photoelectric or oxygen sensors, among others (individual sensors not shown). In one embodiment, the vehicle seat sensors **124** may be utilized to detect the occupancy of the vehicle **102** that may include the user **104** and one or more additional occupants that are seated within the seats of the vehicle **102**. As discussed, the safety alert application **106** may receive data from the vehicle seat sensors **124** and may utilize the data to determine an expected number of occupants (inclusive of the user **104**) within the vehicle **102** that may populated within the travel plan. Additionally, the safety alert application **106** may receive data regarding a number of occupants that are seated within the vehicle **102** upon the user's return to the vehicle **102** from the designated location and may utilize the data to determine a deviation from the travel plan with respect to the user **104** safely returning to the vehicle **102**.

The vehicle **102** may also include vehicle door sensors **126** that may be disposed within one or more portions of the doors (not shown) of the vehicle **102**. The vehicle door sensors **126** may include capacitive, proximity, and/or motion sensors that may be utilized to determine the operation of one or more of the doors of the vehicle **102**. For instance, the vehicle door sensors **126** may determine the opening and closing of the vehicle doors such the trunk door of the vehicle **102** and may provide respective data to the application **106** to be utilized to determine if the trunk (not shown) of the vehicle **102** is opened or closed. In some configurations, the safety alert application **106** may receive data from the vehicle door sensors **126** and may utilize the data to determine a deviation from the travel plan with respect to the user **104** safely returning to the vehicle **102**.

As shown, in an exemplary embodiment, the portable device **108** used by the user **104** may include, but may not be limited to, a mobile device such as a mobile phone or a smart phone, a hand held device such as a tablet, a laptop, and e-reader, etc. In one or more embodiments, the portable device **108** may include a processor **128** for providing processing and computing functions. The processor **128** of the portable device **108** may operably control one or more components of the portable device **108**. The processor **128** may additionally execute one or more applications including the safety alert application **106** to be utilized by the user **104** through the portable device **108**.

The portable device **108** may include a display screen (not shown) that is operably controlled by the processor **128** and may be capable of receiving inputs from the user **104** directly or through an associated keyboard/touchpad (not shown). The display screen may be utilized to present one or more application HMIs to provide the user **104** with various types of information and/or to receive one or more inputs from the user **104**. In particular, the display screen may be capable of receiving inputs from the user **104** directly or through an associated keyboard/touchpad (not shown) In one embodiment, the application HMIs may pertain to one or more application interfaces, including one or more user interfaces associated with the safety alert application **106**.

In one embodiment, the processor **128** may also be operably connected to a storage unit **130** of the portable device **108**. The storage unit **130** may store one or more operating systems, applications, associated operating system data, application data, application user interface data, and the like that are executed by the processor **128** and/or one or more applications including the safety alert application **106**. In one or more configurations, the storage unit **130** may additionally store the travel plan as a data file that is associated with the user **104** and is created or updated based on automatic updates provided by the application **106** and/or manual inputs provided by the user **104**. The travel plan may be created and updated on the storage unit **130** each time the application determines that the vehicle **102** is put into the park transmission mode or that the user **104** actuates the application **106** to create the travel plan. In some embodiments, the travel plan stored on the storage unit **130** of the portable device **108** may be replicated and stored on the storage unit **118** of the vehicle **102** to ensure that the application **106** redundantly stores data associated with the travel plan. It is to be appreciated that the storage unit **130** may include additional travels plans associated with additional designated locations which the user **104** may visit.

In one embodiment, the storage unit **130** may additionally store map data that may be accessed by location sensors **134** of the portable device **108** to determine directional data, distance data, environmental data, and point of interest data pertaining to one or more locations at which the portable device **108** is located. The map data may include data that pertains to geographical maps and satellite/aerial imagery of one or more locations at which the portable device **108** is located. The map data may additionally be accessed by one or more applications executed by the processor **128**. As discussed below, the safety alert application **106** may access the map data to provide a current mapped geo-location of the portable device **108** within one or more alerts that are provided to the one or more emergency contacts, as designated by the user **104**.

In an exemplary embodiment, the processor **128** may additionally be operably connected to a communication device **132** of the portable device **108**. The communication device **132** may include antennas and components that may

be utilized for wired and wireless computer connections and communications via various protocols. The communication device **132** may be capable of providing a wireless system (e.g., IEEE 802.11, IEEE 802.15.1 (Bluetooth®)), a near field communication system (NFC) (e.g., ISO 13157), a local area network (LAN), a wide area network (WAN), a point-to-point system, a circuit switching system, a packet switching system, a cellular network system (e.g., CDMA, GSM, LTE, 3G, 4G), a universal serial bus, and the like.

In particular, the communication device **132** may be utilized to provide web based applications and internet resources to the user **104**. In one embodiment, the communication device **132** may provide a wireless connection (peer-to-peer, Bluetooth®, WAN) with one or more wireless access points to connect the portable device **108** to Wi-Fi network. The communication device **132** may also be utilized to initiate a wireless connection (peer-to-peer, Bluetooth®, WAN) with the communication unit **122** of the vehicle **102** to send and receive electronic signals between one or more of the components of the portable device **108** and one or more components of the vehicle **102**. For example, the communication device **132** of the portable device **108** may connect with the communication unit **122** of the vehicle **102** via a Bluetooth® connection which allows the user **104** to communicate through a hands free telephone system and/or mobile audio system connection. As discussed below, the safety alert application **106** may utilize the determination of the connection of the portable device **108** and the vehicle **102** when determining if there is a deviation from the travel plan that pertains to the user **104** safely returning to the vehicle **102**.

In one or more embodiments, the location sensors **134** of the portable device **108** may include, but may not be limited to, a GPS sensor, an accelerometer, a magnetometer, a gyroscope, among others. The location sensors **134** may be configured to determine a current geo-location (e.g., GPS, DGPS coordinates) of the portable device **108**. The current geo-location of the portable device **108** may be utilized along with map data from the storage unit **130** to provide turn-by-turn directions to the user **104** using the portable device **108**. Additionally, one or more applications may communicate with the location sensors **134** to determine data associated with the current geo-location of the portable device **108**. For instance, the safety alert application **106** may communicate with the location sensors **134** to determine the current geo-location of the portable device **108** upon determination of the deviation from the travel plan that pertains to the user **104** safely returning to the vehicle **102**.

In one or more embodiments, the location sensors **134** may additionally provide a determination as to an actuation of movement of the portable device **108** and acceleration of movement of the portable device **108** from one location to another location. As discussed below, the application **106** may utilize the location sensors **134** to determine if the portable device **108** is being moved from one location to another location and if the portable device **108** is being moved over or under an acceleration threshold.

II. The Vehicle Occupant Safe Return Alert Application and Related Methods

The components of the safety alert application **106** will now be described according to an exemplary embodiment and with reference to FIG. **1**. In an exemplary embodiment, the safety alert application **106** may be stored on the storage unit **118** of the vehicle **102** and/or the storage unit **130** of the portable device **108**. In additional embodiments, the safety alert application **106** may be stored on an external server infrastructure (not shown) and may be accessed by the communication unit **122** to be executed by the ECU **110**/head unit **116** and/or the communication device **132** to be executed by the processor **128**. In an exemplary embodiment, the safety alert application **106** may be automatically enabled based on the sensed movement of the portable device **108** as provided by the location sensors **134** of the portable device **108**. Additionally, the safety alert may be automatically enabled based on manual actuation of the application **106** by the user **104**.

In an exemplary embodiment, during initial execution of the safety alert application **106** on the portable device **108** and/or through the display unit associated with the head unit **116** of the vehicle **102**, a user profile setup phase of the application **106** may be initiated. The user profile setup phase may allow the user **104** to utilize a profile setup user interface (not shown) to add information pertaining to the user **104** (e.g., user's name, date of birth, identification information, photograph, etc.) and add one or more designated names of designated locations (e.g., work, school, etc.) that the user **104** would like to include as previously determined designated locations that the user **104** may plan to visit (e.g., locations that the user **104** frequently visits).

As discussed below, one or more designated locations may additionally be added during an execution phase of the application **106** based on a current location that the user **104** is located that is not added beforehand as a designated location. Upon the user **104** updating the profile setup user interface, the application **106** may store the user profile associated with the user **104** on the storage unit **118** and/or the storage unit **130** to be further utilized by the application **106**. The user safety profile phase may additionally allow the user **104** to utilize an emergency contact settings user interface to designate one or more emergency contacts that may be used by the application **106** to provide the one or more alerts.

FIG. **2** includes an illustrated example of the emergency contact settings interface **200** according to an exemplary embodiment. In one embodiment, the emergency contact settings interface **200** may be presented to the user **104** upon the user's inputs and updates with respect to the profile setup user interface. In some embodiments, the emergency contact settings interface **200** may also be presented to the user **104** based on user input of a respective settings icon (not shown) that may be presented upon the execution of the application **106**.

In one or more configurations the emergency contact settings interface **200** may be presented through the display unit operably connected to the head unit **116** of the vehicle **102** and/or the display device of the portable device **108** used by the user **104**. Upon being presented, the user **104** may utilize the emergency contact settings interface **200** to add and designate the one or more emergency contacts **202** that are to be alerted by the application **106** upon determining the deviation from the travel plan that pertains to the user **104** safely returning to the vehicle **102** from the designated location.

In one embodiment, the user **104** may be presented within an emergency contact input user interface button (not shown) that allows the user **104** to add the telephone numbers and e-mail addresses associated with one or more emergency contacts from a portable device contacts list (not shown) stored on the storage unit **130** of the portable device **108**. In an another embodiment, the user **104** may be able to input the emergency contact user interface button to manually add the telephone numbers and e-mail addresses associated with the one or more emergency contacts.

Upon selection or manual addition of the one or more emergency contacts, the user **104** may additionally pick a primary mode of providing the alert to the respective emergency contact(s). For example, if an emergency contact has a mobile telephone number, a home telephone number, and an e-mail address stored within the portable device contacts list, the user **104** may select the mobile telephone number to be a primary mode of providing the alert to the emergency contact. Upon the addition of the one or more emergency contacts, the emergency contact settings interface **200** may include one or more prioritization input user interface buttons/drop down menus (not shown) that allow the user **104** to prioritize an order of emergency contacts to alert if more than one emergency contact has been designated by the user **104**. As shown within the illustrative example of FIG. **2**, upon the designation of the plurality of emergency contacts, the emergency contact settings interface **200** may present full names of the emergency contacts in an order based on the priority assigned to the each of the plurality of emergency contacts. The names of each of the emergency contacts may also be shown along with a primary mode of providing the alert to the respective emergency contacts.

With continued reference to FIG. **2**, as shown, the emergency contact settings interface **200** may additionally include a user input text box **204** that allows the user **104** to customize a time that may pass between the automatic sending of emergency alerts. In one embodiment, the application **106** may provide a default time (e.g., 5 minutes, as shown) that may be updated by the user **104**. The time that may pass between the automatic sending of emergency alerts may be utilized by the application **106** to determine a predetermined period of time between the sending of each of the one or more emergency alerts to the one or more emergency contacts.

As further shown within the illustrative example, the emergency contact settings interface **200** may include a user input menu box **206** that allows the user **104** to customize the emergency contacts that should be contacted initially upon the application determining the deviation from the travel plan if more than one emergency contact is designated by the user **104**. In one embodiment, if the user selects that all of the emergency contacts should not be contacted initially, the emergency contact settings interface **200** may present a menu **208** to the user **104** that allows the user **104** to select a number of emergency contacts to initially alert. The emergency contact settings interface **200** may also present a user interface menu **210** to the user **104** that allows the user **104** to select a time to wait before sending emergency alerts to additional emergency contacts, based on the priority assigned to the each of the emergency contacts.

In one or more embodiments, upon the designation of the one or more emergency contacts, the input of the user input text box **204**, and user input menu boxes **206-210**, the application **106** may access the user profile (previously created) associated with the user **104** on the storage unit **118** and/or the storage unit **130**. The application **106** may update the user profile with the one or more contacts designated by the user **104**, and additional user customizable settings associated with the one or more emergency contacts, as added via the emergency contact settings interface **200**. It is to be appreciated that the emergency contact settings interface **200** may include additional user customizable settings that are associated with the one or more emergency contacts designated by the user **104** and/or one or more settings associated with the sending of emergency alerts to the one or more emergency contacts.

In one or more embodiments, the user **104** may actuate an emergency alert setup interface based on user input of the respective settings icon (not shown) that may be presented upon the execution of the application **106**. FIG. **3** includes an illustrated example of the emergency alert setup interface **300** according to an exemplary embodiment. As discussed, during the execution phase of the safety alert application **106**, the application **106** may determine the deviation of the travel plan that pertains to the user **104** safely returning to the vehicle **102** from the designated location based on one or more types of deviations that may include the user **104** not arriving to the vehicle **102** within the maximum amount of expected time. Additionally, the one or more types of deviations may include a determination that additional occupants that are above an expected number of occupants occupy the vehicle **102** upon the user's return to the vehicle **102**. The one or more types of deviations also may also include an unexpected opening of the trunk door of the vehicle **102** upon the user's return to the vehicle **102**.

As represented by the illustrated example of FIG. **3**, the emergency alert setup interface **300** allows the user **104** to select and/or update one or more emergency alert messages that may be sent to the one or more emergency contacts designated by the user **104** based on the type of deviation that the application **106** may determine to occur. For example, as shown, the user **104** may be provided with emergency alert messages **302**, **304**, **306** that are associated with each of the one or more types of deviations that may be determined to occur. In one embodiment, the application **106** may allow the user **104** to select from options that include a predetermined text (e.g., call me, text me). The application **106** may additionally allow the user **104** to provide additional text that is added to a default emergency alert message. In an alternate embodiment, the application **106** may allow the user **104** to customize each of the emergency alert messages **302**, **304**, **306** with customizable text.

In an alternate embodiment, the emergency alert setup interface **300** may additionally allow the user **104** to customize one or more emergency alerts that are to be specifically sent to one or more emergency contacts. For example, the emergency alert setup interface **300** may include emergency alert messages (not shown) that are associated with one or more respective emergency contacts in addition to one or more types of deviations that may be determined to occur. This functionality may allow the user to further customize emergency alert messages that are provided to the one or more respective emergency contacts. For example, the user **104** may customize an alert message that is sent to an emergency contact for the emergency contact to call a specific telephone number when the deviation is determined.

As discussed below, if the application **106** determines the deviation from the travel path, the respective emergency alert messages may be sent with a current geo-location of the portable device **108** and/or the vehicle **102** to provide a possible current location of the user **104** to the one or more emergency alert contacts. Therefore, as represented within the illustrative example, the emergency alert messages **302**, **304**, **306** may include a linked current location that may inputted by the one or more emergency contacts to view a mapped geo-location of the portable device **108** and/or the vehicle **102**.

In an exemplary embodiment, the emergency contact settings interface **200** may additionally include additional user customizable settings that may be selected by the user **104** to execute one or more safety features of the application **106**. In particular, the emergency contact settings interface **200** may allow the user **104** to activate a safe lock safety

feature of the application **106**. The safe lock safety feature may ensure that a driver's door of the vehicle **102** may be the only door of the vehicle **102** that is unlocked upon determination of the user's return to the vehicle **102** from the designated location. Additionally, the safe lock safety feature may ensure that once the user **104** enters the vehicle **102**, the doors of the vehicle **102** are automatically locked upon the closing of the door(s). In some embodiments, the safe lock safety feature may be utilized to unlock the driver's door and ensure that other doors of the vehicle **102** are locked when the user **104** is the only occupant that is expected to return to the vehicle **102** from the designated location. Alternatively, when there are additional occupants in addition to the user **104** that are expected to occupy the vehicle **102**, upon the user's return to the vehicle **102**, the safe lock safety feature may unlock all of the doors of the vehicle **102**.

In some embodiments, the emergency contact settings interface **200** may allow the user **104** to activate a trunk disable safety feature. The trunk disable safety feature may ensure that the trunk door remains locked if the travel plan indicates that there is no planned usage of the trunk by the user **104**, as indicated by the user **104**, discussed below. The trunk disable safety feature may subsequently allow the trunk door to be unlocked upon the disabling of the application **106**.

In an additional embodiment, the emergency contact settings interface **200** may allow the user **104** to actuate a warning alarm safety feature that actuates numerous types of alerts based on the determination of the deviation from the travel plan that pertains to the user safely returning to the vehicle **102** from the designated location. Upon actuating the warning alarm safety feature, the user **104** may select to enable or disable one or more types and modes of alerts.

The one or more types of alerts of the warning alarm safety feature may include an audible alert that may utilize the audio system and/or horn (not shown) of the vehicle **102** to provide an audible warning alert from the vehicle **102**. In particular, the audible alarm alert may enable the actuation of the horn of the vehicle **102** and/or the audio system of the vehicle **102** to provide an audible alarm to be heard within a surrounding area of the vehicle **102**. For example, the audible alert may be enabled when the vehicle **102** is located within an urban area and may provide a repeated horn alarm following by an audible assistance request message to alert individuals in the surrounding area of the vehicle **102** of a safety issue.

The one or more types of alerts of the warning alarm safety feature may also include a silent alert that may utilize the lighting system of the vehicle **102** to actuate one or more lights (e.g., hazard lights). In some configurations, the silent alert may utilize the vehicle telephone system and/or the portable device **108** to silently call and/or text emergency authorities (e.g., non-emergency number or emergency number of police) to alert the emergency authorities of a potential safety alert. The silent call may additionally include information pertaining to the vehicle **102** and/or the portable device **108**, including, but not limited to, the geo-location of the vehicle **102**, the geo-location of the portable device **108**, a directional heading of the vehicle **102**, and identifying features of the vehicle **102**, that may include, but may not be limited to, make, model, license plate number, etc.

In one configuration, the user may utilize the emergency contact settings interface **200** to actuate an external lighting mode of the silent alert. The external lighting mode of the silent alert may utilize the lighting system of the vehicle **102** to actuate one or more external lights of the vehicle **102**. For example, the external lighting mode may be enabled to repeatedly flash the external hazard lights and tail lights of the vehicle **102** without providing any indication within the vehicle **102** to alert individuals in the surrounding area of the vehicle **102** of a potential safety issue. In some configurations, the user may utilize the emergency contact settings interface **200** to actuate an internal lighting mode of the silent alert. The internal lighting mode of the silent alert may cause the actuation of internal lights of the vehicle **102**. For example, the internal lighting mode may be enabled to enable the interior lights (not shown) of the vehicle **102** and not allow them to be disabled until the user **104** inputs a specific passcode to a pop-up text input box presented on the user interfaces of the application **106**.

In an exemplary embodiment, upon the selection and/or update of the one or more emergency alert messages and/or one of the aforementioned safety features, the application **106** may access the user profile associated with the user **104** on the storage unit **118** and/or the storage unit **130**. The application **106** may additionally update the user profile with the selections and/or updates of the one or more emergency alert messages and/or one or more safety features.

Upon the creation, updating, and storage of the user profile associated with the user **104**, the safety alert application **106** may be put into the execution phase in order to determine the travel plan that pertains to the return of the user **104** to the vehicle **102** from the designated location and further determine if there is a deviation from the travel plan. In one or more embodiments, the safety alert application **106** may utilize a plurality of modules during the execution phase, including, but not limited to, a travel plan determinant module **136**, a safety confirmation module **138**, and a deviation alert module **140**, discussed in more detail below. It is to be appreciated that the safety alert application **106** may include additional modules and/or sub-modules that are configured to execute one or more functions of the application **106**.

FIG. **4** is a process flow diagram of a method **400** for determining a travel plan that pertains to the return of the user **104** from the designated location during travel of the vehicle **102** according to an exemplary embodiment. FIG. **4** will be described with reference to the components of FIG. **1**, though it is to be appreciated that the method **400** of FIG. **4** may be used with other systems/components. The method **400** may begin at block **402**, wherein the method **400** includes determining that the user **104** is an occupant of the vehicle **102**.

In one embodiment, the ECU **110** of the vehicle **102** may communicate with the travel plan determinant module **136** of the application **106** to communicate data upon receiving an indication that the engine of the vehicle **102** is enabled from the engine control unit **112** and that the vehicle **102** has been put into a drive transmission mode as communicated by the transmission control unit **114**. Upon receiving the data indicating the enabled state and drive transmission mode of the vehicle **102**, the travel plan determinant module **136** may communicate with the navigation system **120** of the vehicle **102** (e.g., through the ECU **110**) to determine the current geo-location of the vehicle **102**. The travel plan determinant module **136** may additionally communicate with the location sensors **134** of the portable device **108** to determine the current geo-location of the portable device **108**. The travel plan determinant module **136** may further compare the current geo-location of the portable device **108** and the vehicle **102** to determine if the user **104** is an occupant of the vehicle **102**. If the travel plan determinant module **136**

determines that the current geo-location of the portable device **108** is within a range (e.g., error acceptance range) of the current geo-location of the vehicle **102**, the module **136** determines that the user **104** is an occupant of the vehicle **102**.

The method **400** may proceed to block **404**, wherein the method **400** may include determining when the vehicle **102** is put into a park transmission mode. In one or more embodiments, upon determining that the user **104** is an occupant of the vehicle **102**, the travel plan determinant module **136** may communicate with the ECU **110** to determine when the vehicle **102** is put into the park transmission mode, after being parked (e.g., by the user **104**). The ECU **110** may communicate with the transmission control unit **114** and may determine when the vehicle **102** is put into the park transmission mode and may further communicate respective data to the travel plan determinant module **136**. Upon the receipt of the respective data by the travel plan determinant module **136**, the module **136** may determine that the vehicle **102** is put into the park transmission mode.

The method **400** may proceed to block **406**, wherein the method **400** may include determining a number of occupants within the vehicle **102**. In one embodiment, upon determining that the vehicle **102** has been put into the park transmission mode, the travel plan determinant module **136** may communicate with the vehicle seat sensors **124** to determine the number of occupants seated within the vehicle **102**. As discussed above, the vehicle seat sensors **124** may be utilized to detect the occupants that are seated within the seats of the vehicle **102**. The vehicle seat sensors **124** may communicate the number of occupants seated within the vehicle seats of the vehicle **102** to the travel plan determinant module **136**.

The method **400** may proceed to block **408**, wherein the method **400** may include updating the travel plan with an expected number of occupants based on the number of current occupants within the vehicle **102**. In one embodiment, upon determining the number of occupants within the vehicle **102**, the travel plan determinant module **136** may access the storage unit **130** of the portable device **108** and may create the travel plan that is stored as a data file on the storage unit **130** and/or the storage unit **118**.

Upon creation and storage of the travel plan, the travel plan determinant module **136** may update the travel plan with the number of occupants as an expected number of occupants (inclusive of the user **104**) within the vehicle **102**. As discussed below, the expected number of occupants may be utilized by the application **106** to ensure that a number of occupants that enter the vehicle **102** after the return of the user **104** to the vehicle **102** do not exceed the expected number of occupants based on the travel plan. In other words, the application **106** may ensure the safety of the user **104** by utilizing the expected number of occupants to ensure that no unexpected/unwanted occupants enter the vehicle **102** that may pose a safety threat to the user **104** upon the user's return to the vehicle **102** from the designated location. As an illustrative example, if the travel plan determinant module **136** determines that that the user **104** is the only occupant seated within the vehicle **102**, the module **136** may update the travel plan with '1' as the expected number of occupants.

The method **400** may proceed to block **410**, wherein the method **400** may include determining that the engine of the vehicle **102** is disabled. In one or more embodiments, upon updating the expected number of occupants, the travel plan determinant module **136** may communicate with the ECU **110** to determine when the engine of the vehicle **102** is disabled, after the vehicle **102** is parked (e.g., by the user **104**). The ECU **110** may communicate with the engine control unit **112** and may determine when the engine of the vehicle **102** is disabled. Upon determining that the engine is disabled, the ECU **110** may further communicate respective data to the travel plan determinant module **136** that may be evaluated to determine that the engine of the vehicle **102** is disabled.

The method **400** may proceed to block **412**, wherein the method **400** may include determining a current geo-location of the vehicle **102** and storing the current geo-location of the vehicle **102**. In an exemplary embodiment, upon determining that the vehicle **102** is disabled, the travel plan determinant module **136** may communicate with the navigation system **120** of the vehicle **102** to determine the current geo-location of the vehicle **102**. The navigation system **120** may responsively communicate the current geo-location of the vehicle **102** to the travel plan determinant module **136**. Upon determination of the current geo-location of the vehicle **102**, the module **136** may access the storage unit **130** and/or the storage unit **118** and may update the travel plan with the current geo-location of the vehicle **102** as the parked location of the vehicle **102**.

In some embodiments, upon storing the current geo-location of the vehicle **102** as the parked location of the vehicle **102**, the travel plan determinant module **136** may present a user interface input icon button (not shown) on the user interfaces of the application **106** presented to the user **104**. The user interface input icon button may be inputted by the user **104** upon the user's departure from the vehicle **102** to provide the user **104** with a mapped location of the current parked location of the vehicle **102** and/or walking turn-by-turn directions to the current parked location of the vehicle **102** to assist the user **104** in case the user **104** is lost upon the user's return to the vehicle **102**. In other words, this functionality may ensure that user **104** is provided with the parked location of the vehicle **102** which may assist the user **104** from getting lost while returning from the designated location to the vehicle **102**.

The method **400** may proceed to block **414**, wherein the method **400** may include determining that the user **104** departs the vehicle **102** for the designated location. In one embodiment, upon the determination that the vehicle **102** is disabled, the travel plan determinant module **136** may communicate with the location sensors **134** of the portable device **108** to determine when the user **104** departs from the vehicle **102** for the designated location based on acceleration information. In one embodiment, the accelerometer of the location sensors **134** may be utilized to provide acceleration information with respect to the movement of the portable device **108** and may communicate respective data to the travel plan determinant module **136** upon determining that the acceleration associated with the portable device **108** is greater than a predetermined acceleration threshold (e.g., indicating that the user **104** is walking away from the vehicle **102**).

In an alternate embodiment, upon the determination that the vehicle **102** is disabled, the travel plan determinant module **136** may determine that the user **104** departs from the vehicle **102** for the designated location based on geo-location information. In particular, the travel plan determinant module **136** may access the storage unit **130** and/or the storage unit **118** to retrieve the current geo-location of the vehicle **102** (as stored at block **412**). Upon retrieving the current geo-location of the vehicle **102**, the travel plan determinant module **136** may communicate with the location sensors **134** of the portable device **108** to determine if a

distance between the current geo-location of the portable device **108** and the current location of the vehicle **102** increases. If it is determined that the current geo-location of the portable device **108** and the current geo-location of the vehicle **102** increases, the travel plan determinant module **136** may determine that the user **104** is departing (e.g., walking away) from the vehicle **102**.

In an additional alternate embodiment, upon the determination that the vehicle **102** is disabled, the travel plan determinant module **136** may determine that the user **104** departs from the vehicle **102** for the designated location based on the disconnection of the portable device **108** from the vehicle **102**. In particular, the communication unit **122** of the vehicle **102** and/or the communication device **132** of the portable device **108** may communicate the disconnection between the communication device **132** and the communication unit **122** to the travel plan determinant module **136**. Upon determining that the communication between the portable device **108** and the vehicle **102** is no longer active, the module **136** may determine that the user **104** departs from the vehicle **102**. For example, upon the user **104** departing away from the vehicle **102**, a Bluetooth® connection between the vehicle **102** and the portable device **108** may be disconnected as the communication device **132** of the portable device **108** is out of a communication/connection range with the communication unit **122** of the vehicle **102** indicating the departure of the user **104** from the vehicle **102**.

The method **400** may proceed to block **416**, wherein the method **400** may include determining when the user **104** arrives at the designated location. In an exemplary embodiment, upon the determination that the user **104** departs from the vehicle **102**, the travel plan determinant module **136** may communicate with the location sensors **134** of the portable device **108** to determine when the user **104** arrives at the designated location based on acceleration information. In one embodiment, the accelerometer of the location sensors **134** may be utilized to provide acceleration information with respect to the movement of the portable device **108** and may communicate respective data to the travel plan determinant module **136** upon determining that the acceleration associated with the portable device **108** is below a predetermined acceleration threshold (e.g., indicating that the user **104** has arrived and is no longer walking away from the vehicle **102**).

In an alternate embodiment, the one or more user interfaces associated with the safety alert application **106** may include a designated location user interface input button (not shown) that may be inputted by the user **104** to provide the application **106** with an indication that the user **104** has arrived at the designated location. Upon the user's input to the designated location user interface input button, the travel plan determinant module **136** may determine that the user **104** arrives at the designated location after traveling to the designated location from the (parked) vehicle **102**.

The method **400** may proceed to block **418**, wherein the method **400** may include determining a geo-location of the designated location. In one or more embodiments, upon determining that the user **104** arrives at the designated location, the travel plan determinant module **136** may communicate with the location sensors **134** of the portable device **108** to determine the current geo-location of the portable device **108** (at the designated location). Upon receiving the current geo-location of the portable device **108**, the travel plan determinant module **136** may access the storage unit **130** and/or the storage unit **118** and may update the travel plan with the current geo-location of the portable device **108** as the determined geo-location of the designated location.

The method **400** may proceed to block **420**, wherein the method **400** may include calculating a maximum expected travel time between the designated location and the vehicle **102**. In an exemplary embodiment, upon determining the geo-location of the designated location, the travel plan determinant module **136** may access the storage unit **130** and/or the storage unit **118** to retrieve map data. As discussed above, the map data may include data that pertains to geographical maps and satellite/aerial imagery of one or more locations. In one embodiment, upon retrieving the map data, the travel plan determinant module **136** may provide route analysis of the map data and may calculate a maximum expected travel time between the designated location and the vehicle **102**. In particular, the maximum expected travel time may include a reasonably maximum amount of time (e.g., minutes) that it may take the user **104** to walk from the designated location back to the (parked) vehicle **102**.

In an additional embodiment, the travel plan determinant module **136** may determine a difference in time between the determination that the user **104** departs from the vehicle **102** for the designated location (as determined at block **414**) and the determination that the user arrives at the designated location (as determined at block **416**) and may output a time difference between the determinations. Upon outputting the time difference between the determinations, the travel plan determinant module **136** may access the location sensors **134** and may determine acceleration information pertaining to the acceleration of the portable device **108** that occurred within the time difference between the determinations. In particular, the module **136** may utilize the acceleration information and the time difference between the determinations of the user **104** departing the vehicle **102** and arriving at the designated location to calculate the maximum expected travel time. In some embodiments, the travel plan determinant module **136** may aggregate the calculation of the maximum expected travel time based on the map data and the calculation of the maximum expected travel time based on the user's departure/arrival and portable device acceleration information (as discussed in the aforementioned embodiments) to calculate the maximum expected travel time as an aggregated value.

The method **400** may proceed to block **422**, wherein the method **400** may include updating the travel plan with the maximum expected travel time between the designated location and the vehicle **102**. In one embodiment, upon calculating the maximum expected travel time between the designated location and the vehicle **102**, the travel plan determinant module **136** may access the storage unit **130** and/or the storage unit **118** to retrieve the travel plan (created at block **408**). The travel plan determinant module **136** may additionally update the travel plan with the maximum expected travel time between the designated location and the vehicle **102**. As discussed below, the maximum expected travel time may be utilized by the application **106** to ensure that the user **104** returns to the vehicle **102** within the maximum expected travel time to determine if the user **104** has reached the vehicle **102** safely. In other words, the application **106** may utilize the maximum expected travel time to ensure that the one or more contacts is alerted if the user **104** does not reach the vehicle **102** upon departing from the designated location to return to the vehicle **102**, which may be indicative of a safety threat to the user **104** upon the users return to the vehicle **102**. As an illustrative example, if the travel plan determinant module **136** calculates that the

maximum expected travel time is '5 minutes', the application **106** may utilize this time to ensure that the user **104** returns to the vehicle **102** from the designated location within five minutes before determining the deviation from the travel plan and sending one or more alert messages to the one or more emergency contacts designated by the user **104**.

FIG. **5**A is a process flow diagram of a method **500** for presenting a travel plan user interface to the user **104** according to an exemplary embodiment. FIG. **5**A will be described with reference to the components of FIG. **1**, though it is to be appreciated that the method of FIG. **5**A may be used with other systems/components. The method **500** of FIG. **5**A may begin at block **502**, wherein the method **500** may include determining if a user action is received to actuate the travel plan user interface. In an exemplary embodiment, the one or more user interfaces associated with the safety alert application **106** may include a travel plan user interface input button (not shown) that may be inputted by the user **104** to present the travel plan user interface to the user **104**. Upon receiving the user input on the travel plan user interface input button, the travel plan determinant module **136** may determine that the user actuation is received to actuate the travel plan user interface.

In one embodiment, the travel plan determinant module **136** may communicate with the location sensors **134** of the portable device **108** to determine the current geo-location of the portable device **108**. Upon determining the current geo-location of the portable device **108**, the travel plan determinant module **136** may compare the current geo-location of the portable device **108** to determine if the user **104** is located at a designated location previously determined to be visited by the user **104** (at blocks **416** and **418**). In an additional embodiment, upon receiving the user input on the travel plan user interface input button, the travel plan determinant module **136** may present a user interface list of pre-stored designated locations (designated by the user **104** during the user profile setup phase) to the user **104** for the user **104** to select. Based on the determination of the designated location, the travel plan determinant module **136** may access the storage unit **130** and/or the storage unit **118** to retrieve the travel plan associated with the user **104** and the designated location.

The method **500** may proceed to block **504**, wherein the method **500** may include presenting the travel plan user interface to the user **104** with the pre-populated calculated maximum expected travel time and expected number of occupants. In an exemplary embodiment, upon determining that the user actuation is received to actuate the travel plan user interface, the travel plan determinant module **136** may communicate with the processor **128** to present the travel plan user interface through the display screen of the portable device **108**.

FIG. **5**B includes an illustrated example of the travel plan user interface **510** according to an exemplary embodiment. As illustrated in the example of FIG. **5**B, the travel plan user interface **510** may be presented with a user input text box **512** that is pre-populated with the maximum expected travel time. In particular, the travel plan determinant module **136** may access the travel plan from the storage unit **130** and/or the storage unit **118** and may retrieve the maximum expected travel time, as previously calculated (at block **418** of the method **400**).

The travel plan determinant module **136** may present the user input text box **512** with the maximum expected travel time between the designated location and the vehicle **102**, as previously calculated by the travel plan determinant module **136**. As stated above, the maximum expected travel time may include a reasonably maximum amount of time that it may take the user **104** to travel (e.g., walk) from the designated location back to the (parked) vehicle **102**. For example, as shown, if the travel plan determinant module **136** calculated that the maximum expected travel time between the designated location and the vehicle **102** is seven minutes, the user input text box **512** may be presented with '7 mins' as the reasonably maximum amount of time that it may take the user **104** to travel (e.g., walk) from the designated location back to the (parked) vehicle **102**. In one or more embodiments, the user input text box **512** may be edited by the user **104** to update the maximum expected travel time, as dictated by the user **104**. For example, if the user **104** plans to take five additional minutes (from the maximum expected travel time) to return to the vehicle **102** from the designated location, the user **104** may edit the user input text box **512** from '7 mins' to '12 mins'.

With continued reference to FIG. **5**B, the travel plan user interface **510** may be additionally presented with a user input text box **514** that is pre-populated with the expected number of occupants of the vehicle **102**. In particular, the travel plan determinant module **136** may access the travel plan from the storage unit **130** and/or the storage unit **118** and may retrieve the expected number of occupants of the vehicle **102**, as previously determined (at block **406** of the method **400**). The travel plan determinant module **136** may present the user input text box **514** with the expected number of occupants of the vehicle **102**, as previously determined by the travel plan determinant module **136**. For example, as shown, if the travel plan determinant module **136** previously determined that the user **104** as the only occupant of the vehicle **102** before the user departed from the vehicle **102**, the user input text box **514** may be presented with '1' as the expected number of occupants of the vehicle **102**, upon the user's return to the vehicle **102** from the designated location. In one or more embodiments, the user input text box **514** may be edited by the user **104** to update the expected number of occupants, as dictated by the user **104**. For example, if the user **104** is planning to have an additional occupant enter the vehicle **102** who was not seated within the vehicle **102** previously, the user **104** may edit the user input text box **514** from '1' to '2'.

With continued reference to FIG. **5**B, in one embodiment, the travel plan user interface **510** may also be presented with a user input menu box **516** that is provided with a 'NO' selection as a default input selection. In one embodiment, the user input menu box **516** may include a drop down input menu that includes also includes a 'yes' input that may be selected by the user **104** to provide indication if the user **104** plans to utilize the trunk of the vehicle **102**. In particular, the user's selection of the drop down menu may allow the application **106** to determine if there is an unexpected opening of the trunk door of the vehicle **102** that occurs upon the user's return to the vehicle **102** from the designated location that may indicate a potential danger to the user **104**.

In additional embodiments, the travel plan user interface **510** may be presented with one or more user input boxes (e.g., checkboxes) (not shown) that may be selected to execute the one or more safety features upon determining the deviation from the travel plan. For example, the travel plan user interface **510** may include one or more user input boxes that allow the user **104** to select the actuation of the safe lock safety feature, trunk disable safety feature, and/or warning alarm safety feature.

It is to be appreciated that the travel plan user interface **510** may be presented with numerous additional user input text input boxes and/or user input menu boxes that allow the

user **104** to provide additional information that may be utilized by the application **106** to determine if there is a deviation from the travel plan that pertains to the user **104** safely returning to the vehicle **102** from the designated location. For example, the travel plan user interface **510** may include settings related to a next intended destination of the user **104** upon returning to the vehicle **102** that may be used to determine if there is a deviation from the travel plan.

Referring again to the method **500** of FIG. **5**A, upon presenting the travel plan user interface **510** to the user **104**, the method **500** may proceed to block **506**, wherein the method **500** may include determining if the user **104** updates the maximum expected travel time, expected number of occupants, and/or planned use of trunk inputs on the travel plan user interface **510**. As discussed above, the travel plan user interface **510** may allow the user **104** to edit the pre-populated user input text boxes **512**, **514** with customized values that respectively pertain to the maximum expected travel time, and the expected number of occupants. The travel plan user interface **510** may additionally allow the user **104** to make a selection of the user input menu box **516** as to if the user **104** plans to utilize the trunk of the vehicle **102**. If it is determined that edits/selections are received on the user input text boxes **512**, **514** and/or the user input menu box **516**, the travel plan determinant module **136** may determine that the user **104** updates the maximum expected travel time, expected number of occupants, and/or planned use of trunk inputs on the travel plan user interface **510**.

If it is determined that the user **104** updates the maximum expected travel time, expected number of occupants, and/or planned use of trunk inputs on the travel plan user interface **510** (at block **506**), the method **500** may proceed to block **508**, wherein the method **500** may include updating the travel plan with the user updates. In an exemplary embodiment, upon determining the updates provided by the user to the travel plan user interface **510**, the travel plan determinant module **136** may access the storage unit **130** and/or the storage unit **118** to retrieve the travel plan (data file). Upon retrieving the travel plan, the travel plan determinant module **136** may update the travel plan with the maximum expected travel time, expected number of occupants, and/or planned use of trunk inputs based on the updates provided by the user to the travel plan user interface **510**. In additional embodiments, if one or more safety features are selected to be executed by the user **104**, the travel plan determinant module **136** may update the travel plan with data indicating the actuation of the respective safety feature. As discussed below, the travel plan may be accessed by the safety confirmation module **138** to determine if there is a deviation from the travel plan that pertains to the user **104** safely returning to the vehicle **102** from the designated location.

In some circumstances, the user **104** may actuate the travel plan user interface at a location that has not been previously designated and pre-stored as a designated location during the user profile setup phase of the application **106**. In other words, the user **104** may be located at a location that does not include an associated travel plan. For example, the user **104** may actuate the safety alert application **106** to ensure that the safety features of the application **106** may be utilized at a time when the user **104** is currently located at a location that was not previously designated as a designated location. In such a scenario, the travel plan determinant module **136** may determine that the location is not a previously designated location based on the geo-location of the user's current location. More specifically, upon determining the current geo-location of the portable device **108**, the travel plan determinant module **136** may compare the current geo-location of the portable device **108** to determine if the user **104** is not located at a designated location previously determined to be visited by the user **104** (at blocks **416** and **418** of the method **400**). Upon determining that the user **104** is not located at a previously designated located, the travel plan determinant module **136** may determine that an associated travel plan is not stored within the storage unit **130** and/or the storage unit **118**, and may consequently present the travel plan user interface **510** to the user **104** with unpopulated user input text boxes **512**, **514**. The user input text boxes **512**, **514** may be respectively input by the user **104** to update the maximum travel time and the expected number of occupants, as dictated by the user **104**. The user input menu box **516** may also be selected by the user **104** to update the planned use of the trunk of the vehicle **102**.

Upon the user's input of the travel plan, the travel plan determinant module **136** may access the storage unit **130** and/or the storage unit **118** to create a travel plan (data file) associated with the user **104** and the current location of the user **104** as a (new) designated location. The travel plan may be updated with the geo-location of the designated location. Additionally, the travel plan may be updated with the maximum expected travel time, expected number of occupants, and/or planned use of trunk inputs based on the updates provided by the user **104** to the travel plan user interface **510**. In some configurations, upon the creation and update of the travel plan, the user **104** may be presented with an option to add the designated location to user interface list of designated locations that are presented to the user **104** upon using the application **106**.

FIG. **6** is a process flow diagram of a method **600** for determining if there is a deviation from the travel plan that pertains to the user **104** safely returning to the vehicle **102** according to an exemplary embodiment. FIG. **6** will be described with reference to the components of FIG. **1**, though it is to be appreciated that the method of FIG. **6** may be used with other systems/components. The method **600** of FIG. **6** may begin at block **602**, wherein the method **600** may include determining if the user **104** departs from the designated location to return to the vehicle **102**.

With continued reference to FIG. **5**B, in an exemplary embodiment, the travel plan user interface **510** may include a user interface input button **518** that may be inputted by the user **104** to indicate that the user **104** is departing from the designated location to return to the vehicle **102**. Upon the user **104** providing an input to the user interface input button **518**, the travel plan determinant module **136** may determine that the user **104** departs from the designated location to return to the vehicle **102** and may respectively communicate the determination to the safety confirmation module **138** of the safety alert application **106**.

In another embodiment, the accelerometer of the location sensors **134** may be utilized to provide acceleration information with respect to the movement of the portable device **108** and may communicate respective data to the travel plan determinant module **136**. The travel plan determinant module **136** may analyze the data and may determine if the acceleration associated with the portable device **108** is greater than a predetermined acceleration threshold for a predetermined period of time (e.g., indicating that the user **104** is walking above a predetermined speed for a predetermined period of time).

If the module **136** determines that the acceleration associated with the portable device **108** is greater than the predetermined acceleration threshold for a predetermined period of time, the travel plan determinant module **136** may

determine that the user **104** departs from the designated location based on geo-location information. In particular, the travel plan determinant module **136** may access the storage unit **130** and/or the storage unit **118** to retrieve the geo-location of the designated location from the travel plan. Upon retrieving the current geo-location of the vehicle **102**, the travel plan determinant module **136** may communicate with the location sensors **134** of the portable device **108** to determine if a distance between the current geo-location of the portable device **108** and the geo-location of the designated location increases. If it is determined that the distance between the current geo-location of the portable device **108** and the geo-location of the designated location increases, the travel plan determinant module **136** may determine that the user **104** is departing from the designated location to return to the vehicle **102** and may respectively communicate the determination to the safety confirmation module **138** of the safety alert application **106**.

If it is determined that the user **104** departs from the designated location to return to the vehicle **102** (at block **602**), the method **600** may proceed to block **604**, wherein the method **600** includes initiating a countdown timer that includes the maximum expected travel time between the designated location and the vehicle **102**. In an exemplary embodiment, upon the safety confirmation module **138** receiving the respective communication regarding the determination that the user **104** has departed from the designated location, the safety confirmation module **138** may access the storage unit **130** and/or the storage unit **118** to retrieve the travel plan associated with the designated location. The safety confirmation module **138** may additionally analyze the travel plan to retrieve the maximum expected travel time between the designated location and the vehicle **102** and may start a respective countdown. In particular, the countdown may include the duration of time of the maximum expected travel time to ensure that the user **104** returns to the vehicle **102** within the previously determined and/or user inputted maximum expected travel time. For example, if the maximum expected travel time is seven minutes (as reflected within the illustrative example of the travel plan user interface **510** in FIG. **5**B), the safety confirmation module **138** may initiate a countdown of seven minutes to ensure that the user **104** travels (walks) back to the vehicle **102** from the designated location within the maximum expected travel time.

The method **600** may proceed to block **606**, wherein the method **600** may include determining if the portable device **108** connects to the vehicle **102** prior to an expiration of the countdown timer. In one embodiment, upon initiating the countdown timer that includes the maximum expected travel time, the safety confirmation module **138** may communicate with the communication unit **122** of the vehicle **102** and/or the communication device **132** of the portable device **108** to determine if the portable device **108** connects to the vehicle **102** prior to an expiration of the countdown timer.

If the communication unit **122** and/or the communication device **132** communicate a connection between one another to the safety confirmation module **138** prior to the expiration of the countdown timer, the safety confirmation module **138** may determine the return of the user **104** from the designated location to the vehicle **102** within the maximum expected travel time. Conversely, if the communication unit **122** and/or the communication device **132** do not communicate a connection between one another to the safety confirmation module **138** prior to the expiration of the countdown timer, the safety confirmation module **138** may determine that the user **104** has not returned to the vehicle **102** from the designated location within the maximum expected travel time.

In an additional embodiment, if it is determined that the communication unit **122** of the vehicle **102** and/or the communication device **132** do not communicate a connection between one another to the safety confirmation module **138** prior to the expiration of the countdown timer, the safety confirmation module **138** may communicate with the location sensors **134** of the portable device **108** to determine the current geo-location of the portable device **108**. The location sensors **134** may communicate the current geo-location of the portable device **108**, the safety confirmation module **138** may access the storage unit **130** and/or the storage unit **118** to retrieve the current geo-location of the (parked) vehicle **102**. The safety confirmation module **138** may compare the current geo-location of the portable device **108** with the geo-location of the vehicle **102**, as retrieved from the travel plan to determine if the portable device **108** is within a predetermined vicinity (e.g., 50 feet) of the vehicle **102**. If it is determined that the portable device **108** is not within the predetermined vicinity of the vehicle **102**, the safety confirmation module **138** may determine that the user **104** has not returned to the vehicle **102** from the designated location within the maximum expected travel time.

If it determined that the portable device **108** is not connected to the vehicle **102** prior to the expiration of the countdown timer (at block **606**), the method **600** may proceed to block **612**. At block **612**, the method **600** may include determining a deviation from the travel plan that pertains to the user **104** safety returning to the vehicle **102**. In an exemplary embodiment, upon determining that the portable device **108** does not connect to the vehicle **102** prior to the expiration of the countdown timer, the safety confirmation module **138** may send a respective communication to the deviation alert module **140** that indicates the determination of the deviation from the travel plan.

In one embodiment, the deviation alert module **140** may access the storage unit **118** and/or the storage unit **130** to retrieve the user profile. As discussed above, during the user safety profile phase, the application **106** may update the user profile with the one or more contacts designated by the user **104**, and additional user customizable settings associated with the one or more emergency contacts, as added via the emergency contact settings interface (as shown in FIG. **2**). The deviation alert module **140** may retrieve the user profile and may send one or more emergency alerts to the one or more emergency contacts as previously designated by the user **104** on the emergency contact settings interface, and as stored within the user profile.

As discussed above, during the user profile setup phase of the application **106**, the emergency alert setup interface (shown in FIG. **3**) allows the user **104** to select and/or update one or more emergency alert messages that may be sent to the one or more emergency contacts designated by the user **104** based on the type of deviation that the application **106** may determine to occur. In one or more embodiments, the deviation alert module **140** may access the user profile to retrieve the emergency alert message associated with the deviation related to the determination that the user **104** does not return to the vehicle **102** prior to the expiration of the maximum expected travel time.

In an exemplary embodiment, the deviation alert module **140** may frame the emergency alert message(s) to include the emergency alert message associated with the deviation that is determined to occur and a mapped location of the portable device **108** and/or the vehicle **102**. In particular, the

deviation alert module **140** may communicate with the location sensors **134** of the portable device **108** to determine the current geo-location of the portable device **108**. Upon determining the current geo-location of the portable device **108**, the deviation alert module **140** may access the map data from the storage unit **130** and/or the storage unit **118** and may include a link that allows the one or more emergency contacts to determine a current mapped location of the portable device **108** that may be used to determine the current geo-location of the user **104**. In additional embodiments, the deviation alert module **140** may communicate with the navigation system **120** of the vehicle **102** and to determine the current geo-location of the vehicle **102**. Upon determining the current geo-location of the vehicle **102**, the deviation alert module **140** may access the map data from the storage unit **130** and/or the storage unit **118** and may include a link that allows the one or more emergency contacts to determine a current mapped location of the vehicle **102** in lieu or in addition to the current mapped location of the portable device **108** that may be used to determine the current geo-location of the user **104**.

In one or more embodiments, the deviation alert module **140** may communicate with the communication device **132** of the portable device **108** to connect to a wireless connection (e.g., cellular, Wi-Fi, Bluetooth®) and send one or more alert messages in the form of silent text message(s) to the telephone numbers associated with one or more emergency contacts. In some configurations, the module **140** may additionally communicate with the communication device **132** to send one or more alert messages in the form of silent e-mail message(s) to one or more e-mail addresses associated with one or more emergency contacts. The silent text message(s) and/or the silent e-mail message(s) may be sent in a manner that does not provide any indication of the sending of the message(s) through the portable device **108** and/or within the vehicle **102**. In some embodiments, multiple silent alert messages may be periodically sent until the user **104** disables the application **106**.

Referring again to the method **600** of FIG. **6**, if it is determined that the portable device **108** connects to the vehicle **102** prior to the expiration of the countdown timer (at block **606**), the method **600** may proceed to block **608**, wherein the method **600** may include determining if a number of occupants that enter the vehicle **102** are greater than the expected number of occupants. In an exemplary embodiment, the safety confirmation module **138** may access the storage unit **130** and/or the storage unit **118** to retrieve the travel plan associated with the designated location. The safety confirmation module **138** may additionally analyze the travel plan to retrieve the expected number of occupants of the vehicle **102** as determined by the application **106** and/or updated by the user **104**, as discussed above.

In one embodiment, upon retrieving the expected number of occupants of the vehicle **102**, the safety confirmation module **138** may communicate with the vehicle seat sensors **124** of the vehicle **102** to determine the number of current occupants within the vehicle **102** upon the return of the user **104** to the vehicle **102**. The safety confirmation module **138** may thereafter compare the number of current occupants within the vehicle **102** to the expected number of occupants of the vehicle **102** as included within the travel plan to determine if the current number of occupants within the vehicle **102** exceeds the expected number of occupants of the vehicle **102**.

If it is determined that the number of occupants that enter the vehicle **102** are greater than the expected number of occupants (at block **608**), the method **600** may proceed to block **612**, wherein the method **600** may include determining a deviation from the travel plan that pertains to the user **104** safely returning to the vehicle **102**. In one embodiment, if the safety confirmation module **138** determines that the current number of occupants of the vehicle **102** exceeds the expected number of occupants, the safety confirmation module **138** may determine that there is a deviation with respect to the number of occupants that enter the vehicle **102** being greater than the expected number of occupants as dictated by the travel plan that pertains to the user **104** safely returning to the vehicle **102**. The safety confirmation module **138** may send a respective communication to the deviation alert module **140** that indicates the determination of the deviation from the travel plan.

In one embodiment, the deviation alert module **140** may access the storage unit **118** and/or the storage unit **130** to retrieve the user profile to determine the one or more contacts designated by the user **104** and additional user customizable settings associated with the one or more emergency contacts. The deviation alert module **140** may retrieve the user profile and may send one or more emergency alerts to the one or more emergency contacts as previously designated by the user **104** on the emergency contact settings interface, and as stored within the user profile.

In one or more embodiments, the deviation alert module **140** may access the user profile to retrieve the emergency alert message associated with the deviation related to the exceeding of the expected number of passengers upon the user's return to the vehicle **102**. The deviation alert module **140** may frame the emergency alert message(s) to include the emergency alert message associated with the deviation that is determined to occur and a mapped location of the portable device **108** and/or the vehicle **102** in a similar manner as discussed above.

In one or more embodiments, the deviation alert module **140** may communicate with the communication device **132** of the portable device **108** to connect to a wireless connection (e.g., cellular, Wi-Fi, Bluetooth®) and send one or more alert messages in the form of silent text message(s) to the telephone numbers associated with one or more emergency contacts. In some configurations, the module **140** may additionally communicate with the communication device **132** to send one or more alert messages in the form of silent e-mail message(s) to one or more e-mail addresses associated with one or more emergency contacts. As stated above, the silent text message(s) and/or the silent e-mail message(s) may be sent in a manner that does not provide any indication of the sending of the message(s) through the portable device **108** and/or within the vehicle **102**. In some embodiments, multiple silent alert messages may be periodically sent until the user **104** disables the application **106**.

In an additional embodiment, based on the actuation of the silent warning safety feature (discussed above) by the user **104**, the deviation alert module **140** may communicate with the ECU **110** of the vehicle **102** to provide a silent warning alert that may indicate the existence of a possible emergency associated with the user **104**. More specifically, upon receiving the communication to provide the silent warning, the ECU **110** may operably control the lighting system of the vehicle **102** to actuate one or more lights (e.g., hazard lights) to flash without notifying any of the occupants of the vehicle **102**. For example, the silent warning may be executed to actuate hazard lights of the vehicle **102** to flash and be seen by onlookers, without providing any internal indication of the hazard lights being used within the vehicle **102**. Upon providing the silent warning, the deviation alert module **140** may present a user interface input icon button

(not shown) on the user interfaces of the application **106** presented to the user **104** that may be inputted to disable the silent warning.

In yet an additional embodiment, based on the actuation of the audible warning alarm safety feature (discussed above) by the user **104**, the deviation alert module **140** may communicate with the ECU **110** of the vehicle **102** to provide the audible warning alert based on the determination of the deviation with respect to the number of occupants that enter the vehicle **102** being greater than the expected number of occupants as dictated by the travel plan that pertains to the user **104** safely returning to the vehicle **102**. More specifically, the ECU **110** may operably control the vehicle audio system to provide an audible alarm to be heard to others within a vicinity of the vehicle **102**. Upon providing the audible alarm, the deviation alert module **140** may present a user interface input icon button (not shown) on the user interfaces of the application **106** presented to the user **104** that may be inputted to disable the audible alarm.

With continued reference to the method **600** of FIG. **6**, if it is determined that the number of occupants that enter the vehicle are not greater than the expected number of occupants (at block **608**), the method **600** may proceed to block **610**, wherein the method **600** may include determining if the trunk of the vehicle **102** is utilized upon the return of the vehicle **102** without a planned use of the trunk. As discussed above, the travel plan determinant module **136** may update the travel plan with the planned use of trunk input based on the updates provided by the user **104** to the user input menu box **516** of the travel plan user interface **510**.

In one embodiment, the safety confirmation module **138** may access the storage unit **130** and/or the storage unit **118** to retrieve the travel plan and may analyze the travel plan to determine the planned use of the trunk upon the user's return to the vehicle **102** from the designated location. If the planned use of the trunk is not indicated within the travel plan, the safety confirmation module **138** may communicate with the vehicle door sensors **126** of the vehicle **102** to determine if the trunk door of the vehicle **102** is opened upon the return of the user **104** to the vehicle **102**. If the vehicle door sensors **126** communicate that the trunk door of the vehicle **102** has been opened upon the return of the user **104** to the vehicle **102**, the safety confirmation module **138** may determine that the trunk is utilized upon the return of the user **104** to the vehicle **102** without the planned use of the trunk.

If it is determined that the trunk is utilized upon the return of the user **104** to the vehicle **102** without the planned use of the trunk, the method **600** may proceed to block **612**, wherein the method **600** may include determining a deviation from the travel plan that pertains to the user **104** safely returning to the vehicle **102**. In one embodiment, if the safety confirmation module **138** determines that the trunk is utilized upon the return of the user **104** to the vehicle **102** without the planned use of the trunk, the safety confirmation module **138** may determine that there is a deviation with respect to the planned use of the trunk as dictated by the travel plan that pertains to the user **104** safely returning to the vehicle **102**. The safety confirmation module **138** may send a respective communication to the deviation alert module **140** that indicates the determination of the deviation from the travel plan.

In one embodiment, the deviation alert module **140** may access the storage unit **118** and/or the storage unit **130** to retrieve the user profile to determine the one or more contacts designated by the user **104** and additional user customizable settings associated with the one or more emergency contacts. The deviation alert module **140** may retrieve the user profile and may send one or more emergency alerts to the one or more emergency contacts as previously designated by the user **104** on the emergency contact settings interface, and as stored within the user profile.

In one or more embodiments, the deviation alert module **140** may access the user profile to retrieve the emergency alert message associated with the deviation related to the planned use of the trunk upon the user's return to the vehicle **102**. The deviation alert module **140** may frame the emergency alert message(s) to include the emergency alert message associated with the deviation that is determined to occur and a mapped location of the portable device **108** and/or the vehicle **102** in a similar manner as discussed above.

In one or more embodiments, the deviation alert module **140** may communicate with the communication device **132** of the portable device **108** to connect to a wireless connection (e.g., cellular, Wi-Fi, Bluetooth®) and send one or more alert messages in the form of text message(s) to the telephone numbers associated with one or more emergency contacts. In some configurations, the module **140** may additionally communicate with the communication device **132** to send one or more alert messages in the form of e-mail message(s) to one or more e-mail addresses associated with one or more emergency contacts. In some embodiments, multiple silent alert messages may be periodically sent until the user **104** disables the application **106**.

In an additional embodiment, based on the actuation of the silent warning alert safety feature by the user **104**, the deviation alert module **140** may communicate with the ECU **110** of the vehicle **102** to provide the silent warning that may indicate the existence of a possible emergency associated with the user **104**, as discussed above. Upon providing the silent warning, the deviation alert module **140** may present the user interface input icon button on the user interfaces of the application **106** presented to the user **104** that may be inputted to disable the silent warning.

In another embodiment, based on the actuation of the audible warning alert by the user **104**, the deviation alert module **140** may communicate with the ECU **110** of the vehicle **102** to provide the audible warning alert based on the determination of the deviation with respect to the planned use of the trunk upon the user's return to the vehicle **102**. Upon providing the audible alarm, the deviation alert module **140** may present the user interface input icon button on the user interfaces of the application **106** presented to the user **104** that may be inputted to disable the audible alarm.

With continued reference to the method **600** of FIG. **6**, if it is determined that the trunk is not utilized upon the return of the user **104** to the vehicle **102** without the planned use of the trunk (at block **610**), the method **600** may proceed to block **614**, wherein the method **600** may include determining that there is no deviation from the travel plan that pertains to the user safely returning to the vehicle **102** from the designated location. In an exemplary embodiment, if the safety confirmation module **138** determines that the portable device **108** connects to the vehicle **102** prior to an expiration of the countdown timer (at block **606**), the number of occupants that enter the vehicle **102** are not greater than the expected number of occupants (at block **608**), and that the trunk is not utilized without the planned use of the trunk (at block **610**), the safety confirmation module **138** may determine that there is no deviation from the travel plan that pertains to the user safely returning to the vehicle **102**. In one embodiment, the safety confirmation module **138** may disable the application **106** to ensure that it no longer is utilized

to send the one or more emergency alerts to one or more emergency contacts and provide one or more safety features of the application **106**.

FIG. **7** is a process flow diagram of a method **700** for determining a deviation with respect to a safe return to a vehicle according to an exemplary embodiment. FIG. **7** will be described with reference to the components of FIG. **1**, though it is to be appreciated that the method of FIG. **7** may be used with other systems/components. The method **700** may begin at block **702**, wherein the method **700** may include determining a travel plan that pertains to the safe return to the vehicle **102** from the designated location.

The method **700** may proceed to block **704**, wherein the method **700** may include determining if the user **104** departs from the designated location to return to the vehicle **102**. The method **700** may proceed to block **706**, wherein the method **700** may include determining if there is a deviation from the travel plan that pertains to the user **104** safely returning to the vehicle **102** from the designated location. The method **700** may proceed to block **708**, wherein the method **700** may include sending at least one emergency alert to at least one emergency contact when it is determined that there is the deviation from the travel plan.

It should be apparent from the foregoing description that various exemplary embodiments of the invention may be implemented in hardware. Furthermore, various exemplary embodiments may be implemented as instructions stored on a non-transitory machine-readable storage medium, such as a volatile or non-volatile memory, which may be read and executed by at least one processor to perform the operations described in detail herein. A machine-readable storage medium may include any mechanism for storing information in a form readable by a machine, such as a personal or laptop computer, a server, or other computing device. Thus, a non-transitory machine-readable storage medium excludes transitory signals but may include both volatile and non-volatile memories, including but not limited to read-only memory (ROM), random-access memory (RAM), magnetic disk storage media, optical storage media, flash-memory devices, and similar storage media.

It should be appreciated by those skilled in the art that any block diagrams herein represent conceptual views of illustrative circuitry embodying the principles of the invention. Similarly, it will be appreciated that any flow charts, flow diagrams, state transition diagrams, pseudo code, and the like represent various processes which may be substantially represented in machine readable media and so executed by a computer or processor, whether or not such computer or processor is explicitly shown.

It will be appreciated that various implementations of the above-disclosed and other features and functions, or alternatives or varieties thereof, may be desirably combined into many other different systems or applications. Also that various presently unforeseen or unanticipated alternatives, modifications, variations or improvements therein may be subsequently made by those skilled in the art which are also intended to be encompassed by the following claims.

The invention claimed is:

1. A computer-implemented method for determining a safe return to a vehicle comprising:

determining at least one safety feature setting associated with at least one vehicle based safety response that is related to a travel plan, wherein the travel plan is created based on data provided by location sensors and vehicle seat sensors and the travel plan pertains to the safe return of a user to the vehicle from a designated location;

determining if the user departs from the designated location to return to the vehicle;

determining if there is a deviation from the travel plan that pertains to the user safely returning to the vehicle from the designated location; and

controlling at least one component of the vehicle to operate based on the at least one safety feature setting to execute the at least one vehicle based safety response when it is determined that there is deviation from the travel plan.

2. The computer-implemented method of claim **1**, wherein determining the at least one safety feature setting includes determining user inputted settings associated with an activation or deactivation of a safety lock feature, wherein the safety lock feature enables at least one door of the vehicle to automatically unlock upon a determination of the user's return to the vehicle and enables a plurality of doors of the vehicle to automatically lock upon a determination of the user's entrance within the vehicle.

3. The computer-implemented method of claim **2**, wherein determining the at least one safety feature setting includes determining user inputted settings associated with an activation or deactivation of a warning alarm safety feature, wherein the warning alarm safety feature enables actuation of an audible alert that utilizes at least of: an audio system and a horn of the vehicle to provide the audible alert when it is determined that there is deviation from the travel plan.

4. The computer-implemented method of claim **2**, wherein determining the at least one safety feature setting includes determining user inputted settings associated with an activation or deactivation of an external lighting mode, wherein the external lighting mode enables actuation of a lighting system of the vehicle to actuate at least one external light of the vehicle to provide a visual alert when it is determined that there is deviation from the travel plan.

5. The computer-implemented method of claim **2**, wherein determining the at least one safety feature setting includes determining user inputted settings associated with an activation or deactivation of a trunk disable safety feature, wherein the trunk disable safety feature enables the trunk to automatically lock if the travel plan indicates there is no planned use of the trunk upon the user's return to the vehicle from the designated location.

6. The computer-implemented method of claim **5**, wherein determining if there is the deviation from the travel plan includes determining the deviation from the travel plan upon determining opening and closing of at least one of: the trunk and at least one vehicle door when the travel plan indicates there is no planned use of at least one: the vehicle door and the trunk upon the user's return to the vehicle from the designated location.

7. The computer-implemented method of claim **1**, further including determining that the user is occupying the vehicle based on a comparison of a current geo-location of the vehicle and a current geo-location of a portable device used by the user upon an enablement of an ignition and a drive transmission mode of the vehicle.

8. A computer-implemented method for determining a safe return to a vehicle comprising:

creating a travel plan that pertains to the safe return of a user to the vehicle from a designated location, wherein the travel plan includes details associated with a utilization of the vehicle and a travel time associated with travel between the vehicle and the designated location;

determining if the user departs from the designated location to return to the vehicle;

determining if there is a deviation from the travel plan that pertains to the user safely returning to the vehicle from the designated location; and

sending at least one emergency alert to at least one emergency contact upon determining the deviation from the travel plan.

9. The computer-implemented method of claim **8**, wherein creating the travel plan includes electronically processing the travel plan, wherein the travel plan is automatically inputted with the details associated with the utilization of the vehicle and the travel time based on sensor data provided by at least one sensor of the vehicle, wherein a travel plan user interface is provided to enable the user to edit the details that are automatically inputted based on the sensor data within the travel plan.

10. The computer-implemented method of claim **8**, further including receiving a user interface input from the user that indicates the user's departure from the vehicle to provide the user with a mapped location of at least one of: a current parked location of the vehicle and walking turn-by-turn directions to the current parked location of the vehicle, wherein a user interface input is received from the user indicating arrival of the user at the designated location after traveling to the designated location from the vehicle.

11. The computer-implemented method of claim **8**, wherein determining if the user departs from the designated location includes determining an acceleration associated with a portable device used by the user and determining if the acceleration associated with the portable device is greater than a predetermined acceleration threshold for a predetermined period of time to further compare the user's location to the designated located.

12. The computer-implemented method of claim **11**, wherein sending the least one emergency alert to the at least one emergency contact includes sending at least one emergency alert message as a silent text message that is sent to the at least one emergency contact, wherein the silent text message is sent in a manner that does not provide an indication of the sending of the at least one emergency alert message through the portable device or within the vehicle.

13. The computer-implemented method of claim **12**, wherein the silent text message is sent to at least one emergency authority, wherein the silent text message includes one of: a geo-location of the vehicle, a geo-location of the portable device, a directional heading of the vehicle, and identifying features of the vehicle.

14. The computer-implemented method of claim **9**, wherein sending the least one emergency alert to the at least one emergency contact includes sending at least one emergency alert message that includes a customized message that is provided by the user, wherein the customized message is based at least one: a type of the deviation and the at least emergency contact.

15. A system for determining a safe return to a vehicle comprising:

a memory storing instructions when executed by a processor cause the processor to:

create a travel plan that pertains to the safe return of a user to the vehicle from a designated location, wherein the travel plan includes details associated with a utilization of the vehicle and a travel time associated with travel between the vehicle and the designated location;

determine if the user departs from the designated location to return to the vehicle;

determine if there is a deviation from the travel plan that pertains to the user safely returning to the vehicle from the designated location; and

send at least one emergency alert to at least one emergency contact upon determining the deviation from the travel plan.

16. The system of claim **15**, wherein creating the travel plan includes electronically processing the travel plan, wherein the travel plan is automatically inputted with the details associated with the utilization of the vehicle and the travel time based on sensor data provided by at least one sensor of the vehicle, wherein a travel plan user interface is provided to enable the user to edit the details that are automatically inputted based on the sensor data within the travel plan.

17. The system of claim **15**, wherein determining if the user departs from the designated location includes determining an acceleration associated with a portable device used by the user and determining if the acceleration associated with the portable device is greater than a predetermined acceleration threshold fora predetermined period of time to further compare the user's location to the designated located.

18. The system of claim **17**, wherein sending the least one emergency alert to the at least one emergency contact includes sending at least one emergency alert message as a silent text message that is sent to the at least one emergency contact, wherein the silent text message is sent in a manner that does not provide an indication of the sending of the at least one emergency alert message through the portable device or within the vehicle.

19. The system of claim **18**, wherein the silent text message is sent to at least one emergency authority, wherein the silent text message includes one of: a geo-location of the vehicle, a geo-location of the portable device, a directional heading of the vehicle, and identifying features of the vehicle.

20. The system of claim **15**, wherein sending the least one emergency alert to the at least one emergency contact includes sending at least one emergency alert message that includes a customized message that is provided by the user, wherein the customized message is based at least one: a type of the deviation and the at least emergency contact.

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